

ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION



1988

Plant Industry Branch
Direction de l'industrie végétale



New Brunswick Department of Agriculture
Ministère de l'Agriculture du Nouveau-Brunswick

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**1988 ADAPTIVE
RESEARCH REPORTS**

**RAPPORTS DE
RECHERCHES
SUR L'ADAPTATION 1988**

**PLANT INDUSTRY BRANCH
DIRECTION DE L'INDUSTRIE VÉGÉTALE
New Brunswick Department of Agriculture
Ministère de l'Agriculture du Nouveau-Brunswick**

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INTRODUCTION

Evaluation and development of new crops, varieties, products and technologies are essential to improving New Brunswick's agricultural production. In this tenth edition of the Adaptive Research Report, Plant Industry Branch publishes the results of a number of projects conducted by staff members. These reports are released to inform producers and agrologists of recent developments and findings in the area of Field Crop, Horticulture, Land Resource and Plant Health. Producers requiring further information on any project should contact the author(s) directly.

I would like to recognize the dedicated efforts of staff members and extend thanks to all producers and organizations that cooperated in the projects.

The editor, David Finnamore, assisted by Serge Michaud are given special acknowledgement for continuing to make this report a reality.

The cost-shared, Canada-New Brunswick Agri-Food Development Subsidiary Agreement is recognized for its financial support to many of the papers.

Acknowledgement is made to the Word Processing Centre for typing the papers, to Information Services for printing and binding the publication and to the Translation Bureau for translating the abstracts.

E. T. Pratt
Executive Director,
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L'évaluation et la mise au point de cultures, de variétés et de techniques nouvelles ainsi que de nouveaux produits sont essentielles pour l'amélioration de notre production agricole. Par cette dixième publication des rapports de recherches sur l'adaptation, la Direction de l'industrie végétale veut faire connaître les résultats d'un certain nombre de projets dirigés par son personnel. Ces rapports informent les producteurs et les agronomes des récents progrès et découvertes dans les secteurs des grandes cultures, de l'horticulture, des ressources des terres agricoles et de la santé des végétaux. Les producteurs qui veulent obtenir plus de renseignements sur un projet particulier doivent communiquer directement avec les auteurs.

Nous remercions tous les producteurs et organismes qui ont collaboré aux projets, sans oublier l'excellent travail des membres du personnel.

Une mention spéciale au chargé de publication, M. David Finnamore, aidé de M. Serge Michaud, pour la publication des rapports.

Nous soulignons également la contribution financière de l'entente auxiliaire Canada-Nouveau-Brunswick sur le développement du secteur agro-alimentaire pour beaucoup de ces projets.

Nos remerciements s'adressent également au Centre de traitement des textes pour la dactylographie des documents, à la Section de l'information pour l'impression et la reliure, et au Bureau de traduction pour la traduction des résumés.

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MOUSE GUARDS FOR APPLE TREES

R. Tremblay, D.A. Arnold, J. Coburn, U. Williams

ABSTRACT: After four years of mouse guard evaluation on young trees at two sites in N.B., I could recommend with some reservations the lore-gard, the wire mesh and the arbogard. The following mouse guards cannot be recommended: drainage tile, white plastic wrapper (spiral guards), black plastic mesh, white plastic mesh and the aluminum reflective vapour barriers (alumi-guard).

PROTECTION DES POMMIERS CONTRE LES SOURIS

Résumé: Après quatre ans d'évaluation des différents types de protecteurs pour les pommiers installés sur de jeunes arbres à deux endroits du Nouveau-Brunswick, on recommande avec certaines réserves le Lore-gard, le grillage métallique et l'Arbogard. Les dispositifs de protection suivants ne peuvent être recommandés : les tuyaux de céramique, le protecteur en plastique blanc (dispositif à spirale), le grillage en plastique noir, le grillage en plastique blanc et le coupe-vapeur réfléchissant en aluminium (Alumi-guard).

INTRODUCTION: The purpose of this trial was to determine the type of mouse guard most effective against mice and the least detrimental to the apple tree.

METHODS AND MATERIALS: Trials were set up in Keswick Ridge and St. Antoine at John Coburns and Eddy Williams respectively. Both trials consisted of drainage tile, lore-gard, white plastic wrapper (spiral guards) black plastic mesh, aluminium reflective vapour barrier (alumi-guard) and wire mesh.

The trial at E. Williams has two additional types of mouse guards: white plastic mesh and arbogard. The set up of this trial consisted of 5 trees per treatment, randomly designed into 3 replications.

RESULTS AND DISCUSSION: Apple growers should not rely solely on mouse guards to prevent tree injury. At the end of harvest mow the orchard sod as low as possible and then apply mouse bait. Mouse guards are of benefit especially on younger trees. Mouse guard must be set into the ground for adequate protection.

In general, mice population was high in the winter of 1987-88.

One tree with the drainage tile (in this trial) showed some possible mouse injury, nevertheless, one farmer has lost the majority of his 4 to 6 years old apple trees in the spring of 1988. It seems that the mice used the drainage tile as a shelter and damaged the trees from the ground up to the crotches of the lower branches. "NOT RECOMMENDED". This incident reminds us that a mouse guard should be fairly close to the trunk of the apple tree but without touching it. It would be preferable to

use a guard that you could increase its circumference as needed.

Lore-guard gave good mice protection but some algae growth occurred on the bark telling us that air circulation was only fair. In some cases the buttons come undone. **RECOMMENDED WITH SOME RESERVATIONS".**

The white plastic wrapper (spiral guards) in this trial showed no mice injury in 1988. Nevertheless, I have seen some injury on one farm in 1988 where the mice took advantage of the gaps in the tree guard and caused serious injury. Some dampness was noticeable on the bark and some were starting to strangle the trees. These guards were removed at E. Williams' request and replaced by Arborgard. **"NOT RECOMMENDED."** The black plastic mesh showed some mouse damage in 1988. **"NOT RECOMMENDED."**

The aluminium reflective vapour barrier (alumi-guard) showed no mice injury but the modified version replaced in 1987 is starting to wear off already and moisture retention was high. **"NOT RECOMMENDED."**

The wire mesh had no mouse damage and good air circulation but is still cutting into the bark at the top of the guard. You could reduce this problem by slightly rolling the top edge toward the outside. **"RECOMMENDED"**.

The white plastic mesh is still showing 1987 scars from mice injury. The mice will eat through the mesh to get to the tree. **"NOT RECOMMENDED."**

The arborgard showed two trees with possible mouse injury. This latex paint and thiram mix should be applied every fall in order to be effective. (Not applied in 1987; applied in 1988). This product will also help in preventing South West injury. **"RECOMMENDED WITH SOME RESERVATIONS"**.

ACKNOWLEDGEMENTS: The authors wish to express their appreciation to Mr. John Coburn of Keswick Ridge, N.B. and Mr. Eddy Williams of St. Antoine, N.B. for their assistance and co-operation in making this project possible.

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SUMMER PRUNING DEMONSTRATION

R. Tremblay and D.A. Arnold

ABSTRACT: A summer pruning demonstration was established in 1986 at the New Brunswick Provincial Observation orchard in Fredericton. Eight McIntosh trees were selected with four being winter (dormant) pruned and four summer pruned. Yield, drops, size, % colour, pressure test and problem areas were analyzed through some of the years.

DÉMONSTRATION D'ÉLAGAGE EN ÉTÉ

Résumé: Un programme de démonstration d'élagage en été fut lancé en 1986 au verger provincial du Nouveau-Brunswick à Fredericton. Huit pommiers McIntosh ont été choisis pour la démonstration; quatre d'entre eux ont été élagués en hiver (à l'état de dormance), et l'élagage des quatre autres a eu lieu en été. Pendant certaines années, on a analysé le rendement, les chutes des pommes, la taille et la coloration des pommes, en plus d'exécuter des épreuves de pression et de cerner les secteurs problèmes.

INTRODUCTION: Before I introduce you to summer pruning, I will summarize the principles of winter pruning.

Toward the end of the winter, the sap starts to rise in the tree prior to any leaf or tree development. It is stored in the terminal buds, and they begin to swell. By pruning (winter dormant pruning) before the tree moves its sap to the terminal-bud positions, you reduce the number of growing points and the charge of sap (nutrients) is distributed to fewer growing points - so a great growth response is initiated for that growing season.

Most of the terminal buds should have already formed at the tip of the shoot before you start summer pruning. It is the shorter shoots that give you the clue if summer pruning should be started or not. If you start to summer prune before these terminal buds are closed, late summer growth can start and is liable to be killed by severe winter temperatures. Even worse than this, if you summer prune too soon, potential fruit buds may revert to vegetative buds and reduce next year's crop potential. Summer pruning is a technique for cutting down on tree vigour permitting better light exposure for an improved fruit color, calcium content and increase bud strength.

This trial was set up to observe some differences between summer pruning and winter pruning.

MATERIALS AND METHODS: Eight apple trees were selected for this trial. Four of them were summer pruned and four winter pruned only. Seven of the trees are Imperial Red McIntosh on the rootstock Malling Merton 111 and the eighth one with the same cultivar but on Malling 7 (summer pruned). These trees were planted in 1976 in the New Brunswick Provincial Observation Orchard in

Fredericton. The summer pruning started in the summer of 1986 (early August). Prior to this, the trees were only winter pruned (4 trees were not winter pruned in 1986) usually in March.

The summer pruning was always done after most of the terminal buds were already formed at the tip of the shoots (early August 1987). Pesticide and fertility treatments have been the same for all eight trees.

In 1988, the summer pruning was done at the end of August. Pruning cuts were made by heading back in 2 or 3 year old wood (never limited to 1 year old growth as it will respond by initiating two or three shoots where one grew previously) and also heading back to some of the first apples to permit earlier and better colouring, easier picking and better grade. Fruit spurs that were situated under the lower branches were almost all removed as well as most watersprouts (not done by some researchers during summer pruning).

The summer pruned trees would only receive dormant pruning for structure improvement or repair of breakage.

Three pressure tests were taken on each apple with a pressure tester.

The apples were stored in bushel boxes in the cold room (0°C) of the Plant Industry Branch from harvest time until testing time.

RESULTS AND DISCUSSION: On the average, 183% more apples were harvested in 1988 (Sept. 27 & 29) on the winter pruned trees ((W.P.) 3 bushels/tree) than the summer pruned ((S.P.) 1.06 bu/tree). One of the main reasons was the extra 69.6% of drops that were noticeable with the S.P. trees (average drops/tree S.P. = 268 apples; average drops/tree W.P. = 158 apples) at harvesting time (Table 1). A lot of drops occurred during the late summer pruning; touching some apples with the pruning equipment, (hand shears and pruning hook) your head (watch out they are hard!!) hands, shaking caused by pruning cuts, setting up the ladder, branch and apples falling through the tree canopy, etc.

In 1988, the summer pruned trees had apples (80 were tested) with an average pressure test of 9.87 p.s.i. (January 7,8, 1989) compared with 10.0 p.s.i. for the winter pruned ones. The W.P. apples were only 4 1/8 (2.49 inches) bigger than the S.P. (2.38 in). But it could make a monetary difference depending if you export your apples or not (Table 1). A minimum size of 2 3/8 (2.3) is now required in order to sell fresh apples outside of New Brunswick. Some of the apples were severely injured

because of a hailstorm that occurred on July 11, 1988, so no bruising evaluation was done due to summer pruning. Canker was noticeable on some stubs that were left from previous summer pruning cuts. A video film was taken once all the summer pruning was done in 1988 and is available from the Fruit Crops Specialist.

In 1989, an average diameter of tree canopy spread should be taken in order to know how much smaller are the summer pruned trees (if at all smaller). Better colouring of the apples was more prominent in 1988 than the two previous years but we cannot rely on this information since we had so many drops (Table 1, 2, 3). Since 1986, the overall size of the apples has been going down for both pruning techniques (Table 1, 2, 3).

The average pressure tests have always been better with the winter pruned apples from 1986 to 1988 but in some cases very small differences. More years of testing will be needed in order to really evaluate summer pruning.

TABLE 1: AVERAGES - 1988 HARVEST (SEPT. 27 & 29)

	<u>Winter Pruned</u>	<u>Summer Pruned</u>
Bushels/tree	3.0	1.1
Drops/tree	158	268
Fruit Diameter (inches)	2.49	2.38
% Colour (red) (80 apples)	78.8	88.9
Pressure test (p.s.i.) (80 apples Jan. 7 & 8, 1989)	10.0	9.87

TABLE 2: AVERAGES - 1987 HARVEST (SEPT. 23)

	<u>Winter Pruned</u>	<u>Summer Pruned</u>
Size (inches) apple (100 apples, Oct. 27)	2.49	2.46
(20 apples Dec. 8)	2.70	2.73
% Colour (red) (100 apples Oct. 27)	75.5	74.4
(20 apples Dec. 8)	77.5	82.0
Pressure Test (psi) (20 apples Oct. 27)	14.1	12.9
(20 apples Dec. 8)	11.7	11.0
(20 apples Jan. 7, 1988)	9.1	9.3

TABLE 3: AVERAGES - 1986 HARVEST

<u>Summer Pruned</u>	<u>Sept. 22</u>	<u>Sept. 24</u>
Size (inches)/apple	2.8	2.52
% Colour (red)	84.4	86.6
Pressure test (psi)	10.9 (Feb. 12 or 17/87)	10.5 (Jan. 14, 1987)
Problem	Brown core	No brown core
<u>Winter Pruned</u>	<u>Sept. 24</u>	<u>Sept. 29</u>
Size (inches)/apple	2.68	2.93
% Colour (red)	89.3	88.8
Pressure Test (psi)	10.68 (Jan. 14/87)	11.00 (Feb. 12 or 17/87)
Problem	No brown core	Brown core

ACKNOWLEDGEMENTS: I would like to thank Gerald Reed for his involvement in the pruning and different tests done in this trial from 1986 to the winter pruning of 1988.

ASSESSMENT OF PLUM AND CHERRY CULTIVARS

R. Tremblay, D.A. Arnold, E.W. Estabrooks

ABSTRACT: A planting of promising plum and cherry cultivars was made in the Provincial Orchard in Fredericton in 1983 and also cherry cultivars were planted at the Ferme Bourgeois in Pré d'En-Haut, N.B. Cherries were harvested in 1988 at the Ferme Bourgeois only and plums in Fredericton.

ÉVALUATION DE CULTIVARS DE PRUNIER ET DE CERISIERS

Résumé: Des cultivars prometteurs de pruniers et de cerisiers ont été plantés dans le verger provincial de Fredericton en 1983. Des cultivars de cerisiers ont été plantés en même temps à la Ferme Bourgeois de Pré-d'en-Haut (N.-B.). Une récolte de cerises a été faite en 1988 à la Ferme Bourgeois seulement, et une récolte de prunes a eu lieu à Fredericton.

INTRODUCTION: During the past decade, a number of new plum and cherry cultivars have been introduced which are reported to have characteristics of improved hardiness, superior quality or increased productivity. It is our intention that these characteristics be evaluated in the coming years.

MATERIALS AND METHODS: Establishment and record of cultivar performance can be found in Adaptive Research Reports for 1984, 1985, 1986, 1987. The plum cultivars are: METHLEY; BURBANK; YELLOW EGG; CALIFORNIA BLUE; OZARK; VALOR; OTTAWA 3010 (VANIER); SUPERIOR; EARLY GOLDEN; STANLEY; MOUNT ROYAL and BLUE FREE. The cherry cultivars are: METEOR; NORTH STAR; STELLA; MONTMERCENCY and WINDSOR.

RESULTS AND DISCUSSION: See Table 1 and 2 for plum yields, period of harvest and average weight per plum. See Table 3 for cherry yields.

CHERRIES: After 5 years (4 for Montmorency) of establishment (1983) there were still no cherries on Windsor and very few on Montmorency (1987).

No cherries were produced in 1988 at the Provincial Orchard in Fredericton and yields were reduced at the Ferme Bourgeois. We attributed bad pollination caused by frost in the spring as the main yield reducer.

By 1986, 5 of the 14 Windsor cherry trees were dead at Ferme Bourgeois as well as 1 dead Windsor and 3 dead Stella cherry trees at the Fredericton Provincial Orchard. Netting should always be used to prevent birds from harvesting the cherries.

Correction of 1987 data: Table 3 should have read:

Stella	0.03 kg/tree P.O.
Montmorency	0.01 kg/tree P.O.
Meteor	3.28 kg/tree F.B.
Northstar	0.82 kg/tree F.B.

At harvest time, (August 8, 1988) the Northstar cherries were overripe and starting to split whereas the Meteor were not quite ripe.

PLUMS: After 5 years of establishment (1983) there is still no plums on Methley, Ozark and Ottawa 3010 (Vanier). By 1986, all the Superior plum trees were dead as well as one Methley and one Yellow Egg.

Slight russeting was noticeable on California Blue and Mount Royal. The California Blue plums were falling off the tree by August 26 but didn't appear to be overripe (no splitting). By September 20, (last harvest), the Stanley plums were still on the tree but had split (overripe). On August 18, the Early Golden plums were overripe. The Bluefree plums were not ripe on the first harvest date (September 22). Are the Bluefree plums starting to have a biennial fruiting habit with an average yield of 0.69 kg per tree in 1988 compared with 8.48 kg per tree in 1987? This question should be answered in the years to come. Thinning might help in solving this problem.

TABLE 1: AVERAGE YIELD (KG) PER TREE IN 1988

Variety	Average Yield (kg/tree)
Mount Royal	7.32
Stanley	1.49
Blue Free	0.69
California Blue	0.44
Burbank	0.08
Yellow Egg	0.04
Early Golden	0.03
Valor	----

For more detailed information on cherry and plum cultivars and pollination, you could refer to the publication "Fruit cultivars, A Guide For Commercial Growers" from the Ministry of Agriculture and Food of Ontario. pp. 27-32 and 63-70.

TABLE 2: PERIOD OF HARVESTING AND AVERAGE WT. PER PLUM
(g) IN 1988

Variety	Harvest Start	Harvest Finish	Ave. Wt. Per Plum (g)
Blue Free	22 Sept.	27 Sept.	53.3
California Blue	18 Aug.	26 Aug.	45.47
Early Golden	18 Aug.	18 Aug.	38.7
Yellow Egg	18 Aug.	18 Aug.	37.6
Burbank	2 Sept.	2 Sept.	32.9
Stanley	13 Sept.	20 Sept.	31.7
Mount Royal	2 Sept.	8 Sept.	22.2
Valor	----	-----	----

TABLE 3: FRUIT YIELD OF CHERRY CULTIVARS IN 1988
(August 8) AVERAGE YIELD (kg/tree)

Variety	P.O.	F.B.
Meteor	0.00	0.91
Northstar	0.00	0.71
Stella	0.00	----
Montmorency	0.00	----
Windsor	----	----

P.O. - Provincial Orchard, Fredericton

F.B. - Ferme Bourgeois, Pré d'En-Haut

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HALF-HIGH BLUEBERRY CLONE EVALUATION

C. Murray, A. Jaswal and B. Dykeman

ABSTRACT: The evaluation of Minnesota half-highbush blueberry clones was continued. Yields were up from 1987, in some cases doubled. Investigation revealed the presence of several viral diseases within most clones.

ÉVALUATION DE CLONES DE BLEUET SEMI-GÉANT

Résumé: L'évaluation de clones de bleuets semi-géants de type Minnesota s'est poursuivie. Les rendements ont été supérieurs à ceux de 1987, et ils ont doublé dans certains cas. Une étude a indiqué la présence de plusieurs maladies virales dans la plupart des clones.

INTRODUCTION: In 1980, nine clonal selections from the Minnesota State University blueberry breeding program; one N.B. selection from a seedling line of Mn3; and Mel, a University of Maine selection were established for evaluation in New Brunswick. All of these clones originated from interspecific crosses of highbush (Vaccinium corymbosum) and lowbush (V. angustifolium) plants.

MATERIALS AND METHODS: The clones were placed in a randomized block design with four replications. Six plants per plot were used at a spacing of 1.0 m x 2.0 m. The trial was established at the N.B. Horticulture Centre on a riverbank loamy sand. Plants were mulched in the fall of the establishment year with 5 cm of sawdust.

The plots were fertilized each spring with 50 kg/ha of N, P₂O₅ and K₂O and irrigated throughout the season as required, excepting 1987.

The trial was established on new land with low fertility and low soil organic matter. For this reason, growth and establishment was slow. Lack of uniformity in the bushes and extensive witches broom infection led to the decision in spring 1986 to prune severely. The bushes were reduced to six inch stumps and left to recover.

Data of yield, fruit quality and plant growth were recorded from 1983-85, and again in 1987 and 1988.

RESULTS AND DISCUSSION: Productivity: As in other years, there were significant differences between clones in their yield and fruit size (Table 1). Mn 84 produced the largest crop. Yields were increased from 1987, and in some cases doubled (see Table 1).

TABLE 1: PERFORMANCE OF HALF-HIGH BLUEBERRY CLONES IN 1988

Clone	Yield (g/plot)	100 Berry wt (g)	1988 Projected Yield (kg/ha)	1987 Projected Yield (kg/ha)
Mn84	25945	169.3	21621	11684
NBBC1	18724	151.8	16248	10671
Mn 354	16939	165.0	14116	9571
Mn 135	11834	166.8	9862	7425
Mn 61	9235	116.0	7696	8796
Northblue	7999	243.3	8011	8405
Mn 327	7254	119.8	6607	8922
Northsky	6588	144.5	5656	7044
Mn 330	3851	94.8	8013	5485
Me 1	3554	85.3	3357	4707
NorthCountry	2422	102.5	2222	5808
LSD (.0)	8719	6.0	7597	-

TABLE II: DISEASE INCIDENCE IN AN 8-YEAR OLD PLANTING OF HALF-HIGH BLUEBERRY CLONES

Clone	Witches Broom (% Infection)	Viral Diseases* (% Infection)
Mn84	62.5	0
NBBC1	54.0	0
Mn 354	54.0	0
Mn 135	70.8	0
Mn 61	20.8	25.0
Northblue	49.8	62.5
Mn 327	79.3	37.5
Northsky	37.5	62.5
Mn 330	49.7	40.0
Me 1	8.5	25.0
NorthCountry	45.8	37.5

* % of diseased samples from a total sample size of 8 (in which buds from 3 plants would be combined for one sample).

Fruit Quality: No flavour evaluation was done this season, and the problem of abscission zone tearing was not as severe as in 1987.

Disease Management: Three diseases had been considered major - witches broom, blueberry canker, and mummy berry. However, a viral test revealed the presence of tomato ringspot, leaf mottle, shoestring and tobacco ringspot viruses. Correlation analysis was carried out between yield and viral infections, and yield and witches broom infections. No significant correlation between yield and witches broom existed. However, a strong negative correlation (-0.68) was evident between the percent viral infection and yield per plant. There was only a weak correlation between percent viral disease and number of plants surviving and no correlation between survival and witches broom. It was thought that blueberry canker may have been responsible for most plant losses within the trial.

Of the four viruses tested in 1988, the tomato ringspot virus and the blueberry leaf mottle virus had the largest negative effect on yield ($r = -0.69$ and -0.60 respectively).

This points to a need for virus free stock before the genetic potential of the various clones can be accurately evaluated.

CONCLUSION: Yields continued to increase with the age of the planting. A better moisture supply in 1988 would also have contributed to higher yields as demonstrated by higher berry weights. Before the half-high clones can be evaluated further, virus free stock must be obtained and programs to minimize witches broom and blueberry canker infection must be developed.

HIGHBUSH BLUEBERRY CLONE EVALUATION

C. Murray and B. Dykeman

ABSTRACT: Six highbush blueberry cultivars and one half-high clone are being evaluated for hardiness and adaptability at the N.S. Horticultural Centre, Hoyt. The half-high clone, NBBC1, outyielded the best highbush cultivar by 174%. Winter injury continues to be extensive among the highbush cultivars.

ÉVALUATION DE CLONES DE BLEUET GÉANT

Résumé: Six cultivars de bleuets géants et un clone de bleuets semi-géant ont été évalués au Centre horticole provincial de Hoyt afin d'établir leur rusticité et leur capacité d'adaptation. Le rendement du clone semi-géant NBBC1 était de 174 % supérieur à celui du meilleur cultivar de bleuets géants. Le gel continue de faire des dégâts importants chez les cultivars de bleuets géants.

INTRODUCTION: Any perennial fruit crop to be grown in this area must exhibit a high degree of winter-hardiness. Using this criteria, six highbush blueberry (*Vaccinium corymbosum*) cultivars were selected for a cold-hardiness trial, along with one half-high clone (*V. corymbosum* x *angustifolium*) of known cold hardiness and high production capability.

Differential Thermal Analysis (DTA) was performed on bud and stem tissue for two years (1985-86, 86-87) to evaluate relative tissue and bud hardiness. No significant differences between clones were found.

To make the planting more uniform, all fruit buds were pruned in 1986. Harvest data was gathered in 1987 and 1988.

Some additional pruning was done in the spring of 1988 to remove diseased wood (stem canker and witches broom) as well as winter-killed twigs.

MATERIALS AND METHODS: The seven cultivars were planted in a RCBD, with six plants per replication and four replications. Spacing was 1 m x 2 m. The plants are fertilized with 50 kg/ha N, P₂O₅ and K₂O in the spring and irrigated as necessary.

RESULTS AND DISCUSSION: Harvest yields were increased over the 1987 season, and the gap between NBBC1 and the highbush cultivars has narrowed. (Falling from 325% greater yield in 1987 to 174% in 1988.) Five harvests were made from August 4 to September 1. Average 100 berry weight increased from 1987 (see Table 1).

Winter injury was fairly extensive in 1987-88. Many of the flower buds were lost on the hardier cultivars as well as extensive tip dieback on the more tender cultivars.

TABLE 1: PERFORMANCE OF HIGHBUSH BLUEBERRY CULTIVARS
1988

Cultivar	Total Yield (g/plot)	100 Berry wt (g)	1988 Projected Yield (kg/ha)	1987 Projected Yield (kg/ha)	1988* Hardi- ness
NBC1	10,101	229.3	8,673	5,338	8
Northland	5,968	200.8	4,974	1,689	7
Patriot	4,520	301.3	4,091	946	6
Burlington	2,906	199.5	2,629	334	4
Blue-ray	1,508	250.0	1,257	966	2
Bluecrop	1,349	321.5	1,124	213	5
Spartan	1,087	343.5	906	162	1
LSD (.05)	4,488	9.7	3,502	-	-

*subjective rating based on twig and flower losses:
0 = 100% kill, 10 = no injury

COMMERCIAL FEASIBILITY OF RED CURRANTS

R. Tremblay and B.W. Dykeman

ABSTRACT: A plantation of red currants was established in 1985 at the N.B. Horticulture Center, Hoyt, N.B. Yield results have been evaluated for three years.

FAISABILITÉ COMMERCIALE DE LA CULTURE DES GADELLIERS

Résumé: On a créé en 1985 une plantation de gadelliers au Centre horticole de Hoyt (N.-B.). Les rendements obtenus ont été évalués pendant trois ans.

INTRODUCTION: Currants are a member of the Ribes species and the fruit is a true berry. Rarely, if ever, are they available in New Brunswick markets. This bush-type fruit is easy to grow and very hardy. Currants have a bushy non-spreading growth habit. Most currants are self-fruitful, hence there is usually no need to provide for cross-pollination. Red currants fruit at the base of 1 - year old wood and more so on spurs of 2 and 3 year old wood. Older wood produces inferior fruit. The object of pruning is to remove wood older than three years and to replace it with a suitable number of younger shoots. This trial was established to evaluate the commercial feasibility of growing red currants in New Brunswick.

MATERIALS AND METHODS: The red currant cultivar Von Tets was planted in 1985 at the N.B. Horticulture Center, Hoyt, N.B. The spacing was set at 2 meters between the rows and 1 meter apart on the row. Irrigation water was applied in 1988 but only once a week after harvest. No pruning was done in 1988. Every week from June 15, 1988 until the first week of September, the following pesticides were applied: Thiodan (1 l/ha); Captan (2 kg/ha) or Benlate (0.5 g/ha) in alternate weeks. On April 11, 1988, 500 kg/ha of 15-15-15 was applied.

RESULTS AND DISCUSSION: See Table 1 for the yield of the red currant Von Tets for the last three years. The 1988 and 1987 yields are very comparable. The 1989 crop will give us an idea if the yields are starting to stabilize or not.

The currant aphids were controlled early in the season in 1988.

TABLE 1: YIELD OF VON TETS

	<u>kg/40 bushes</u>	<u>kg/ha</u>
1986	9.48	1185
1987	23.77	2971
1988	19.50	2437

REFERENCES: Tremblay, R., B.W. Dykeman 1987. Commercial Feasibility of Red Currants. Adaptive Research Reports. N.B.D.A. Vol. 9, 18.

GOOSEBERRY SHELF-LIFE STUDY 1988**C. Murray and P. Hunter-Burley**

ABSTRACT: Four varieties of gooseberries were tested for storageability and shelf-life. Seven (7) days in storage did not significantly alter quality. As time on the shelf increased, quality decreased.

**ÉTUDE DE LA DURÉE DE CONSERVATION DES
GROSEILLES - 1988**

Résumé: On a fait des essais avec quatre variétés de groseilles pour connaître leur aptitude à l'entreposage et leur durée de conservation. La qualité des fruits conservés pendant sept jours n'a pas beaucoup diminué. La qualité diminue proportionnellement à leur durée de conservation.

INTRODUCTION: Gooseberries have traditionally been grown in the U.K. for processing into jams and jellies. Commercial production has never developed in North America because of the lack of a processing market. Today, interest exists in marketing this fruit on the fresh market. Therefore, there is a need to determine the storage and shelf-life characteristics and requirements of this fruit.

MATERIALS AND METHODS: Four cultivars of gooseberries (Sebastien, Selby, Sabine, Hinnonmake Red) were harvested and placed into plastic bags, then layered with ice in a cooler to remove field heat. The fruit was graded to remove split or blemished fruit, then put into pint pulp containers (punts). The punt and fruit was weighed, and placed in a cooler at 2-4 C, 95% humidity. Each cultivar was divided into three lots of five samples each. After 3, 5, and 7 days one lot would be put on a shelf at room temperature. On each of five days one sample per variety was reweighed and various parameters tested. The parameters measured were flavor (1-very poor to 5-excellent), % soluble solids, pH and weight of non-marketable fruit.

Soluble solids and pH were determined by extracting juice from a 100 g sample. Refractometer (soluble solids) and pH readings were carried out on the juice.

Flavor was a subjective rating determined by one person.

RESULTS AND DISCUSSION: Although a tough-skinned fruit, the gooseberry ruptures relatively easily. This leads to grading and handling difficulties (Note: when harvesting it was noted that the riper fruits were less likely to tear at the stem ends, but more likely to rupture if dropped any distance greater than 10 cm). For this reason, it is not advised to put gooseberries in overly large containers, as the weight will crush or split the bottom fruit. Any weakness in the skin is an opening for fungal rots, which establish very quickly.

Essential to maintaining the quality in the fruit is immediate removal of field heat, and then keeping the fruit cool. As shelf life gets longer, the percent of nonmarketable fruit due to rot increases. Gooseberries that are not cooled immediately and kept refrigerated develop spoilage within a couple of days.

As was expected, the fruit lost weight over time both in storage and on the shelf. This did not greatly affect the appearance, however. A possible solution would be to increase the humidity to 100%.

Soluble solids increased over time, as the fruit dehydrated, and as the ripening process continued. It is thought that after reaching a plateau not yet determined, the soluble solids would stop increasing and possibly even decrease. There was not much change in pH for either storage time or time on the shelf.

CONCLUSION: Gooseberries have sufficient self-life to be handled on the fresh market. With immediate cooling after harvest, the fruit can be stored for a seven (7) day period without appreciable loss of quality. Up to five (5) days on the shelf did not seriously affect the quality, either. However, it should be noted that as time on the shelf increased, so did the percent nonmarketable.

The authors feel that as a result of this trial, more investigation into the potential of gooseberries as a fresh market fruit is justified.

TABLE 1: GOOSBERRY FRUIT SIZE AND YIELD/HA (2 YEAR AVERAGE) *

Variety	Berry Size (g)	Yield/ha (kg)
Sebastien	7.9	3965
Selby	6.0	4780
Sabine	4.2	5949
Hinnonmake Red	3.8	3896

*Note: These data are courtesy of Margie Luffman, Agriculture Canada, Senator H.J. Michaud Experimental Farm.

TABLE II. VARIOUS PARAMETERS GOVERNING GOOSEBERRY QUALITY DURING STORAGE AND SHELF DISPLAY

Treatment		% Weight Loss	% Soluble Solids	pH	% Non- Marketable
Days in storage	3	3.3	10.7	3.1	5.1
	5	4.2	11.6	3.0	3.8
	7	6.5	12.4	3.1	5.9
LSD (.01)		2.6	2.3	0.1	-
Days on shelf	1	2.1	10.3	3.0	1.0
	2	3.6	11.1	3.1	1.9
	3	5.5	12.0	3.1	3.2
	4	5.5	12.1	3.1	6.0
	5	6.7	12.2	3.1	12.7
LSD (.01)		2.6	2.3	-	9.8

OBSERVATION OF DAY-NEUTRAL STRAWBERRIES

R. Tremblay, B.W. Dykeman and W. Perry

ABSTRACT: A trial of two day-neutral cultivars was established in 1988 at the Horticultural Centre in Hoyt, New Brunswick. The objective was to evaluate the cultivars Tristar and Tribute. In 1988, the Tristar produced 64% more strawberries (5,719 kg/ha) than the Tribute (3,487 kg/ha) however the average 10 berry weight was slightly better for the Tribute at 105 g compared with 94 g for the Tristar.

OBSERVATION DES FRAISIERS À JOURS NEUTRES

Résumé: En 1988, on a fait l'essai des cultivars de fraisières à jours neutres Tristar et Tribute au Centre horticole de Hoyt (Nouveau-Brunswick). Le cultivar Tristar a produit 5 719 kg/ha de fraises et le Tribute, 3 487 kg/ha, soit une différence de 64 %; toutefois, le poids moyen de dix fraises était un peu plus élevé pour le Tribute (105 g) que pour le Tristar (94 g).

INTRODUCTION: Day neutral strawberries are different in many respects from the Junebearing type. The period when they initiate flowers buds is different; short days (12 hours) for Junebearers; any day length for the day-Neutrals. The flower buds (day-neutrals) will continue to develop as long as temperatures are not too hot or too cold. The Day-Neutrals were harvested from late August to early October in this trial.

The wild strawberry, Fragaria virginiana var. glauca, has been backcrossed with cultivated strawberries to obtain large fruited, productive day-neutral cultivars.

MATERIALS AND METHODS: Two hundred and fifty Tristar and 250 Tribute plants were planted on May 27, 1988. Spacing: 30 cm between plants and 91 cm between the rows. Each row is 7.6 m long. The plot started with two rows of Tristar followed by two rows of Tribute, 2 rows of Tristar, etc. for a total of 10 rows of each cultivar.

Prior to plantation, a soil analysis showed a pH of 5.7; 2% organic matter; phosphate (P_2O_5) 487 kg/ha-very high; potash (K_2O) 430 kg/ha-very high; calcium 804 kg/ha-low, and magnesium 225 kg/ha-high.

A preplant application of 15-15-15 (300 kg/ha) was applied as well as some 10-52-10 at plantation time. One week later 300 g/100 l of 20-20-20 was applied. All the weeding was done with a hoe.

Every week from June 15, 1988 until the first week of September, the following pesticides were applied: Thiodan (1 l/ha); Captan 2 kg/ha) or Benlate (0.5 g/ha) in alternate weeks. No runners were allowed to grow between the rows (they were removed as needed). All blossoms were removed until the 6 leaf stage. Plants

were irrigated once a week. Straw mulch was applied under the plants during the last week of July 1988 and again as winter protection in November.

RESULTS AND DISCUSSION:

TABLE 1: FALL PERFORMANCE OF TWO DAY NEUTRAL STRAWBERRY CULTIVARS 1988.

	<u>Yield (kg/ha)</u>	<u>Average 10 berry weight (g)</u>
Tristar	5,719	93.88
Tribute	3,487	105.56

TABLE 2: CROPPING HABIT OF TWO DAY-NEUTRAL CULTIVARS - 1988

	<u>Average 10 berry weight (g)</u>		
	<u>Aug. 24- Sept. 2</u>	<u>Sept. 6 - Sept. 16</u>	<u>Sept. 19 - Oct. 4</u>
Tristar	110.86	86.10	89.92
Tribute	91.46	102.45	116.52

The cultivar Tristar outyielded the Tribute by 64%. It produced an equivalent of 5,719 kg/ha compared to 3,487 kg/ha for Tribute. The average 10 berry weight over a seven week harvesting period was in favour of the Tribute by an extra 11.7 grams (Table 1). By June 23, most of the plants were at the 4 to 5 leaf stage and on August 11 a few berries were seen on both cultivars with one ripe berry per plant and still flowers. The first and last fruit were harvested on August 24 and October 4 respectively. The straw mulch should have been applied in June in order to cool the root zone because day/night temperatures of 26/22°C cause the plant to become long-day in reaction thus producing runners at the expense of flower buds.

No tarnish plant bug injury was noticeable. You cannot use the Thiodan when you are going to harvest twice a week since it has a 7 pre-harvest interval. The Captan has a 2 day and Benlate a 1 day interval.

The fruit of the cultivars Tribute increased in size as the harvesting season progressed (Table 1). The last

berries were harvested on October 4, 1988. The minimum air temperature at Hoyt Blissville on that day was 4.5°C ; 5.5 on the 5; 2.5 on the 6 and -4.5°C on the 7 and 8 of October. At a temperature of -3.3°C the flowers, fruit buds and developing berries of strawberry plants will be injured.

Some crown injury has been seen already in December 1988 on junebearing cultivars at the N.B. Horticulture Center in Hoyt. Unmulched plants were killed with no chance of recovery and the mulched one are also injured but not to a non recovery level by Dec. 19, 1988. The soil temperature at a depth of 5 cm was -12°C 8:00 a.m. and -7°C at 5:00 p.m. on bare soil. This is going to be a good test on the winter survival of the day-neutrals. More data will be analyzed in 1989.



ASPARAGUS CULTIVAR TRIALS - HOYT, NEW BRUNSWICK

G. Chevrier and L. Rankin

ABSTRACT: In an evaluation of twenty-one asparagus cultivars and/or breeding lines, C.V. Jersey Giant and breeding line D2X 22/8 produced the highest yields in each category of spear size classification. The yields of all cultivars were notably light considering the age of the plantation (4 years). Reduced yields were attributed to a widespread infection of Fusarium, consequently the trial was terminated at the end of the 1988 season.

ESSAIS DE CULTIVARS D'ASPERGE À HOYT (NOUVEAU-BRUNSWICK)

Résumé: Lors d'une évaluation de vingt et un cultivars d'asperge ou de variétés souches, le cultivar Jersey Giant et la variété souche D2X 22/8 ont donné les meilleurs rendements dans chaque catégorie en ce qui a trait à la grosseur des pointes. Le rendement de tous les cultivars était particulièrement faible compte tenu de l'âge des plants (quatre ans). On considère que la jaunissure fusarienne très répandue est responsable des rendements réduits et, par conséquent, on a mis un terme aux essais à la fin de la saison de 1988.

INTRODUCTION: Asparagus is a cool season perennial crop that is well adapted to temperate regions. Early season spear production offers growers a marketable harvest at a time when relatively few fresh (locally produced) vegetable products are available. Once established, an asparagus plantation can remain productive for 10 to 15 years. Interest in this specialty crop has recently increased in the Atlantic provinces. The potential for expanding the present asparagus acreage (with improved cultivars) exists as fresh market consumption increases.

MATERIALS AND METHODS: Twenty-one cultivars and/or breeding lines of asparagus were established in a 4 replicate randomized complete block design at the Hoyt Horticultural Center, Hoyt, New Brunswick in 1984. Each replicate consisted of a single row measuring 12m long with an inter row spacing of 1.3 m.

Fertilizer (15-15-15) was applied at the rate of 300 lbs. prior to spear emergence in the spring. Simazine was applied to the plot on April 11 at a rate of 2 kg/ha.

The 1988 season was the first year of harvest for this trial that was established in 1984. The trial was scheduled for first picking in 1987, however, low vigor in the stand at that time delayed harvest by one year.

Harvesting commenced on May 12, 1988 and was completed by May 30, 1988. During that time, 9 harvests were taken. Spears were cut below the soil surface and graded on the basis of basal diameter. Large-basal diameters of at least 11.1 mm (7/16"), medium-basal diameter of at least 9.5 mm (3/8") Utility-basal diameter of at least 6.4 mm (1/4") Culls-basal diameter of less than 6.4 mm

(1/6"). Spear length at grading ranged between 18 cm (7") and 23 cm (9"). Spears longer than 23 cm were cut back to that length. The number and weight of spears harvested in each category on each date were recorded. Table 1 summarizes the results of the harvest.

RESULTS:

TABLE 1 - ASPARAGUS YIELDS (kg/ha) - HOYT, N.B.

Cultivar Name	Large	Medium	Utility	Culls	Percent Marketable
J.Giant	476.5a	232.5a	182.3a	171.2a	83.9
D2X 22/8	437.6a	196.8ab	178.6a	154.7ab	84.0
62/205	308.7bc	192.8ab	162.7ab	150.6a-c	81.5
Viking KB3	306.5bc	185.1ab	138.8ab	132.8a-d	82.6
277C X 22/8	282.9cd	169.8a-c	128.3a-c	120.5a-e	82.8
40/207	280.3cd	159.3a-d	126.8a-c	104.9b-f	84.4
Luc. 1/79/6	265.6c-e	154.3b-d	125.8a-c	99.2b-f	84.6
G136	251.5c-e	153.5b-d	117.1a-d	95.1c-f	84.6
Luc.					
Midseason	247.9c-e	152.4b-d	111.9b-d	93.7c-f	84.5
G171	204.8c-f	145.1b-e	106.9b-e	90.4d-g	83.5
G127	195.8c-f	140.5b-e	101.9b-f	82.8d-h	84.1
G124	176.4c-f	128.0b-e	100.3b-f	81.2d-h	83.3
J.					
Centennial	172.7c-f	126.0b-e	100.1-f	79.3d-i	83.4
Lucullus					
1/79/1	162.9c-f	95.0c-f	67.4c-g	66.9e-j	82.9
G185	148.4c-f	85.9d-f	63.9c-g	61.8e-j	82.8
Larac	144.8d-f	80.8d-f	51.9d-g	50.9f-j	84.5
Franklin	116.5ef	73.2ef	43.9e-g	46.1f-j	83.5
G188	90.3f	69.2ef	37.9fg	30.2g-j	86.7
52/205	68.3f	45.0f	37.8fg	23.2h-j	86.7
Viking 2G	63.0f	44.1f	25.9g	19.2ij	87.4
G193	45.8f	42.4f	15.1g	12.4j	89.3

DISCUSSION AND CONCLUSION: From the harvest data in Table 1, Jersey Giant and D2X 22/8 yielded significantly higher than all other cultivars in the large spear classification. These two cultivars also displayed higher yields in the medium and utility categories, however the differences were not significant. All cultivars produced high percent marketable yields (on a weight basis).

In general, the yields of all cultivars were depressed when compared to what the yield should be for a four year old asparagus plantation. It was felt that this was the result of Fusarium infection that was noted on the first harvest date in a few cultivars. By the end of the harvest period, infected spears were widespread and noted in all replicates and

cultivars. This may explain the low plant vigor that was noted at the beginning of the 1987 season and the low yields obtained from relatively dependable (Lucullus mid-season and Jersey Centennial) cultivars in 1988. Visual assessments of the extent of infection were taken in July and late August. From these assessments, it was recommended that the trial be discontinued and plowed under.



RAISED BED TECHNIQUE FOR CARROTS

T.J. Johnson, C.U. Goguen and P.V. LeBlanc

ABSTRACT: The marketable yield of carrots was higher on raised beds than on the flat, but the difference was not statistically different. The carrots produced on a raised bed were longer and more slender at the shoulder, thus a carrot with a better market appearance.

PRODUCTION DE CAROTTES SUR BILLONS

RÉSUMÉ: Le rendement de carottes vendables était plus élevé sur billons que lorsque plantées sur le plat, mais cette différence n'était pas significative. Les carottes produites sur billons étaient plus longues et plus minces au collet, ce qui améliore l'apparence au marché de la carotte.

INTRODUCTION: The technique of growing carrots on raised beds in organic soils is now a widely used technique in Ontario and parts of Quebec. The beds are made with a drum roller which makes firm raised beds of different widths depending on the grower's machinery requirements. Growers in Ontario have noticed that there is less wind erosion problems with their use, they benefit from earlier soil warming on raised beds and the firm seedbeds offer better seed germination conditions.

These many advantages made it imperative that the technique of raised beds be evaluated under New Brunswick conditions of soil and climate. The organic soils of Ontario are not the same as those of New Brunswick. Those of New Brunswick are sphagnum peat bogs while those of Ontario are muck soils. This experiment's objective was therefore to evaluate this technique under our growing conditions.

MATERIALS AND METHODS: The experiment was carried out on the St. Charles Bog in 1987 and 1988. The two treatments evaluated were the conventional planting on the flat vs planting on raised beds. The raised beds were made with a drum roller manufactured in Ontario. The beds were 15 cm high and 60 cm wide. The cultivar Spartan Fancy was seeded in both of the treatments. Fertilizer and pesticide applications were the same on both treatments and these were applied by the growers. At harvest, six plots of 5.5 m length were randomly harvested from each planting treatment. Soil temperature and humidity were also monitored during the whole growing season in both years. Soil temperatures were measured using a Campbell Scientific CR 21 datalogger with sensors installed at depths of 5, 20 and 30 cm in both treatments. Water tension measurements were taken every second day intervals using tensiometer of 10, 20 and 30 cm.

RESULTS AND DISCUSSION:**a) 1987 Experiment:**

There was no significant difference in the number of plants emerged in the different planting systems (Table 1). Marketable yields were 12.2% higher on raised beds than those planted on the flat, however, this difference is not statistically significant. The yields were 32.3 t/ha on the raised beds compared to 26.6 t/ha on the flat.

There was a statistical difference between the two systems in the percentage of carrots harvested in each size category. More of the carrots harvested on raised beds were in the smaller size categories (19-32 mm category). The number of jumbo (45 mm+) carrots was significantly higher on the planting on the flat. Length measurements were taken from the harvested carrots. Although no significant difference was found, the data indicated a trend toward longer carrots on the beds than on the flat.

b) 1988 Experiment:

As in 1987, there was no significant difference in plant density between the two systems (Table 2). Carrot yields were 10.6% higher on raised beds compared to the conventional seeding. This difference was again not different statistically probably because of the low number of replications or treatments involved in this study.

There was a statistical difference in the percentage of carrots harvested in each size category. More carrots of the 32-45 mm category were harvested on the raised beds. Carrots of the 32-45 mm and 45+ mm size category were also significantly longer on raised beds.

c) Soil Temperature and Humidity Data:

The soil temperature results from both growing seasons showed an average of one to two degrees Celsius warmer in the raised beds compared to planting on the flat. This extra heat, especially early in the growing season when the peat is cooler could certainly benefit the carrot crop and be partially responsible in the yield advantage of the beds.

In general, there was no difference in water tension between the two planting systems. This means that crops grown of the raised beds did not suffer from a water deficit. The maximum difference recorded between the two systems was 32 mbar in 1987 and 22 mbar in 1988.

CONCLUSION: Carrots should be grown on raised beds on the St. Charles Bog because of the better growing conditions. Yields and market appearance were shown to be better in the two years of testing. Growers have also commented that their carrot harvester works better on raised beds.

ACKNOWLEDGEMENT: Appreciation is expressed to the manager of the St. Charles Coop, Mr. Emile Chevarie, Gérard Thébeau, vegetable technician at the Senator Hervé J. Michaud Experimental Farm and Carmen Léger, summer student.

TABLE 1. EFFECT OF PLANTING SYSTEM ON PLANT DENSITY, CARROT YIELD AND % OF CARROTS IN EACH SIZE CATEGORY (1987)

Treatment	Plant Density	Yield T/ha	% 19-32 mm	% 32-45 mm	% 45 mm+
Raised Beds	112.8 a	32.3 a	23.1 a	63.2 a	13.6 b
Standard	121.1 a	26.6 a	11.1 b	50.8 a	38.1 a

Means followed by the same letter are not significantly different at the 5% level

TABLE 2: EFFECT OF PLANTING SYSTEM ON PLANT DENSITY, CARROT YIELD, % OF CARROTS IN EACH SIZE CATEGORY AND LENGTH OF CARROTS IN EACH SIZE CATEGORY (1988)

	Treatments	
	Raised Beds	Standard
Plant density/plot	134.7 a	147.7 a
Yield t/ha	26.9 a	24.3 a
% 19-32 mm	33.2 a	41.2 a
% 32-45 mm	60.4 a	51.2 b
% 45 + mm	6.3 a	7.5 a
Length (cm) of 19-32 mm size	23.0 a	22.0 a
Length (cm) of 32-45 mm size	22.4 a	20.9 b
Length (cm) of 45 + mm size	21.6 a	19.4 b

Means followed by the same letter are not significantly different at the 5% level.

FIELD ESTABLISHMENT OF FIDDLEHEADS

B. Dykeman and C. Murray

ABSTRACT: A study was established in 1985 to evaluate the effect of planting depth and mulching on early rhizome production and new crown development in the field. After 3 years, plant vigor was improved by both deep planting and mulching, but new crown development was not enhanced.

CULTURE DES CROSSES DE FOUGERE DANS LES CHAMPS

Résumé: Une étude a été entreprise en 1985 pour évaluer les effets de la profondeur de plantation et du paillage sur la production hâtive de rhizomes et sur le développement des nouvelles pousses dans les champs. Après trois ans d'essai, on peut affirmer que la plantation en profondeur et le paillage ont permis d'accroître la vigueur des plants, sans toutefois améliorer le développement des pousses.

INTRODUCTION: A goal in establishing any perennial crop is to bring it into full production in as short a period of time as possible. In fiddleheads, this means 1) increasing the plant population from the 10,000 plant planting-rate to 300,000 plants per hectare and, 2) attaining full crozier size potential. Rapid plant reproduction in the field is dependent on the rate of rhizome production and on the vigor and longevity of the mother crowns.

MATERIALS AND METHODS: The study, established on a riverbank sandy loam utilized 1 1/2 year old dormant plants of clone NB44 in a 2 factor RCBD. Plots were 2 m x 6 m with 12 plants per plot with four replications. The treatments were as follows:

- | | |
|------------------|---|
| Planting depths: | 1. planted with crown at previous soil level. |
| | 2. planted with crown just covered with soil. |
| | 3. planted in a 15 cm trench with crowns at the bottom of the trench. |
| Mulching: | 1. no mulch |
| | 2. 5 cm mulch the first fall, and 2 cm applied each fall thereafter. |
| | 3. 5 cm mulch applied once at planting time. |

Fertilizer (15-15-15) was incorporated at a rate of 600 kg/ha in the spring before planting. 15-15-15 at the rate of 1000 kg/ha was applied annually.

Parameters measured included the rate of daughter crown production frond height, and fronds per crown. These components were used to calculate a productivity index (P.I.).

RESULTS AND DISCUSSION: In the third year of data collection, no significant differences have yet emerged. However, there seems to be a trend favoring one-time mulching and soil level planting for all parameters.

TABLE 1. SUMMARY OF 1988 YIELD COMPONENT DATA FOR THE FIDDLEHEAD FIELD ESTABLISHMENT TRIAL.

	Treatment	P.I.+	Frond Height (cm)	Fronds /Crown	Plants /m ²
Mulch	0	16.7	65.0	13.5	18.9
	At planting	18.9	63.3	13.5	22.1
	Annual	15.6	61.8	12.5	20.1
Depth of planting	Original Depth	19.2	62.3	13.3	23.3
	Top of Crown	15.8	62.9	13.3	18.9
	15 cm trench	16.2	64.9	13.0	18.9
Interaction		N.S.	N.S.	N.S.	N.S.

+Productivity Index

COMPARATIVE PERFORMANCE OF SELECTED CLONES AND THEIR PROGENY

B. Dykeman and C. Murray

ABSTRACT: A study was initiated in 1986 to determine the differences in productivity between selected clones and their progeny produced from spores via intergametophytic selfing. After two years of data, it was concluded that the clonal plants were far more vigorous and productive than their progeny.

RENDEMENT COMPARATIF DE CLONES SÉLECTIONNÉS ET DE LEUR PROGÉNITURE

Résumé: Une étude a débuté en 1986 pour déterminer les écarts de productivité entre des clones sélectionnés et leur progéniture, produite à partir de spores, par autofécondation entre gamétophytes frères. Deux ans plus tard, on avait pu constater que les clones étaient plus vigoureux et productifs que leur progéniture.

INTRODUCTION: From early work on genetic variability and selection potential (Dykeman, 1985) it was clear that there is good potential for selecting high yielding clones of the ostrich fern. However, the move towards clonal cultivars generally means higher propagation costs and therefore higher establishment costs. While these higher costs can be readily justified for many asexually propagated horticultural crops, the advantages have not been demonstrated for fiddleheads. Clearly, the cost of producing plants from spores is far less than the cost of plants from tissue culture - the current clonal propagation method.

In the production of plants from spores various levels of selfing and cross fertilization are possible. The most feasible system of propagation, which would allow some control of variability and therefore some degree of predictability, is analogous to self-fertilization in flowering plants. This system would involve the production of gametophytes (n) from spores of a single sporophyte (2n). The gametes produced by these gametophytes would be allowed to cross freely, resulting primarily in intergametophytic selfing (sib mating). This system would also allow a small degree of intragametophytic selfing, resulting in completely homozygous sporophytes. The numbers of the latter type should be low.

The objective of this study was to compare the performance, productivity and variability of several selected clones with that of plants produced from their spores via sib1-gametophytic mating (self-fertilization); and thereby to determine the merits or necessity of clonal propagation.

MATERIALS AND METHODS: The study was established at the N.B. Horticultural Centre, Hoyt on June 3, 1986. Two year old crowns were utilized. Four clones; NB 6, NB 12, NB 39 and NB 53, were included in the study along with their progeny produced from spores via intergametophytic selfing. Ten (10) plant plots were used with three replications in a randomized block design. Plots were 5 m rows spaced 2 m apart.

The field was limed to approximately pH 6.5 prior to planting. Fertilizer (15-15-15 at 300 kg/ha) was applied prior to planting and again in mid-July. A 5 cm mulch of sawdust was applied in September, 1986. Plots were fertilized in 1987 and 1988 with 100 and 150 kg/ha of nitrogen respectively using a 15-15-15 fertilizer.

RESULTS AND DISCUSSION: As can be seen in Table 1, the clonal plants produced by tissue culture were far more productive than their progeny produced via spores. The components of yield (frond height, fronds per crown and plants/m²) are summarized in the productivity index. This value rates the relative vigour and makes selection easier.

The sharply reduced vigour of the clones progeny as compared to the clones was not expected. It was expected that the sporling plants would have a fair degree of variability but contain both superior and inferior plants to the parent clone. The low level of vigour among these plants suggest the release of weak recessive genes through the inter and possibly intra-gametophytic selfing from which they were derived. These results suggest that production of plants via spores will not be a viable alternative to asexual clonal propagation.

REFERENCES: Dykeman, B.W., 1985. Genetic Variability and Selection Potential in the Ostrich Fern. In Ph.D thesis. University of New Brunswick. pp. 35-54.

TABLE 1: COMPARATIVE PERFORMANCE OF SELECTED CLONES OF THE OSTRICH FERN AND THEIR PROGENY 1988.

Clone	Productivity Index (P.I.)	Frond Height (cm)	Fronds /Crown	Number Daughters	Plants /m ²	1987 P.I.
30C+	19.1	73.6	12.9	81.5	18.3	3.5
39S	5.2	52.5	9.5	41.7	10.3	1.5
6C	11.7	80.3	9.5	67	15.4	2.4
6S	6.2	56.8	10.8	40	10.0	1.5
53C	8.9	74.0	10.7	49.7	11.9	3.2
53S	3.3	45.9	9.5	27.3	7.5	0.5
12C	6.2	59.4	11.4	36	9.2	1.5
12S	1.4	37.9	10.8	12	3.5	0.6
Clones	11.5	71.8	11.1	58.6	13.7	2.6
Siblings	4.0	48.3	10.2	30.3	7.8	1.0
Significance	*	**	NS	*	*	
Interaction	NS	NS	NS	NS	NS	

+C = clones, S = progeny derived from spores

*, ** means are significantly different at the 5% and 1% levels respectively of the LSD test.

POPULATION DYNAMICS IN MATURE FIDDLEHEAD STANDS

C. Murray and B. Dykeman

ABSTRACT: A study was initiated in 1985 to study the plant population shifts in a mature stand, and to evaluate the effects of annual mulching and harvesting on the population and plant vigor. Data is still inconclusive after 3 years of harvesting.

CARACTÉRISTIQUES VITALES DES PEUPELEMENTS DE CROSSES DE FOUGÈRE PARVENUS À MATURITÉ

Résumé: Une étude a été lancée en 1985 pour connaître la variation des caractéristiques vitales des peuplements de croses de fougère parvenus à maturité et pour évaluer les effets annuels du paillage et de la récolte sur le nombre de plants et sur leur vigueur. Après trois ans de récolte, on juge que les données ne sont pas encore concluantes.

INTRODUCTION: Little is known of the population dynamics of mature stands of fiddleheads - length of crown life, rate of new crown development and the effect of harvesting on these two variables. Also unknown is the long-term effect of mulching on plant population and vigor. A trial was initiated in 1985 to study this situation, using a plantation established in 1969 by R. White (CDA). The crowns were transplanted from the wild and allowed to grow without interference for 18 years.

In 1985, the first management inputs were applied - fertilizer and herbicides. In 1986, the first harvest was taken.

MATERIALS AND METHODS: Plots 2 m x 1 m and subdivided into mulched and unmulched plots of 1 m x 1 m were staked out in an established stand at M.P. Harrison's, Maugerville. Fertilizer (15-15-15) at a rate of 600 kg/ha is applied annually in the spring. Aged sawdust is applied in the fall after frost to a depth of 2 cm on the mulched plots.

The herbicides Roundup (500 ml/5L) and Simazine (255 g/5L) (1 kg active/ha) are applied in the spring pre-emergence to control weeds.

RESULTS AND DISCUSSION: Initial data showed a positive response to management inputs. However, the third harvest year showed a marked drop in the number of croziers harvested, crozier and yield per plot. Plant populations remained the same (see Table I). The study will require several more years of data before conclusions can be drawn.

Weeds present in the plots are Joe-Pye-weed, dandelions, horsetail, goldenrod, wild cucumber and burdock.

TABLE 1. GROWTH AND YIELD PERFORMANCE OF A MATURE OSTRICH FERN STAND

Treatment	No. Croziers Harvested	Crozier wt (g)	Plot Yield (g)	Plants /m ²	Projected Yield (kg/ha)
- 1986 -					
No mulch	232.8	3.1	721.5	45	7,215
Mulched	193.8	3.5	637.1	40.8	6,371
- 1987 -					
No mulch	390.3	4.0	1196.6	31.5	11,966
Mulched	324.8	3.8	1190.6	26.0	11,906
- 1988 -					
No mulch	205.3	2.8	555.3	31.5	5,553
Mulched	231.0	2.7	623.8	27.5	6,238
	N.S.	N.S.	N.S.	*	

*means are significantly different at the 5% level of the LSD test.

UNHEATED GREENHOUSE PRODUCTION OF LETTUCE

Andrew W. Currie

ABSTRACT: Head (South Bay MI) and Romaine (Parris Island COs) Lettuce was produced in an unheated greenhouse structure located at the N.B. Horticultural Centre located in Hoyt, N.B. Six week old seedlings were transplanted through black plastic mulch. There were four replications of 960 plants grown in the greenhouse. Average plant weights and heights were recorded.

PRODUCTION DE LAITUE DANS DES SERRES NON CHAUFFÉES

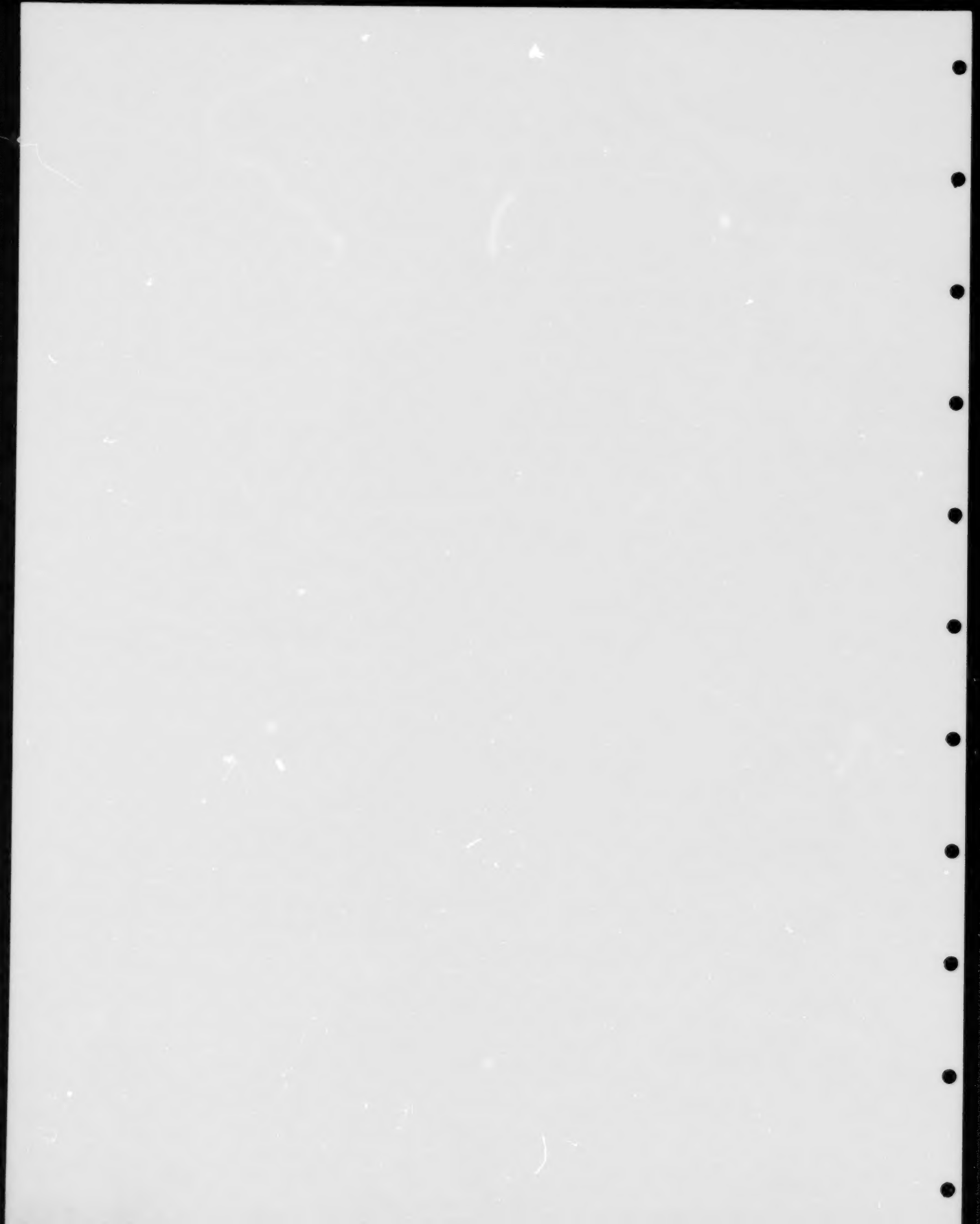
Résumé: La laitue pommée South Bay MI et la laitue romaine Parris Island COs ont été cultivées dans une serre non chauffée du Centre horticole provincial de Hoyt (N.-B.). Les jeunes plants de six semaines ont été transplantés dans une terre recouverte d'un paillis de plastique noir. On a disposé sur quatre lots identiques les 960 plants cultivés dans la serre. Le poids moyen et la hauteur moyenne des plants ont été enregistrés.

INTRODUCTION: Scheduling of lettuce allows for a greater degree of reliability in supply to wholesale accounts for many of our existing producers. This trial is an effort to enhance lettuce production by demonstrating the earliness of greenhouse grown lettuce. This crop is designed to precede any field harvests. Varieties were sown March 20th and transplanted in the greenhouse on May 5. The harvests were concluded by June 14th.

RESULTS:

Block	Variety	Average Weight (gms)	Plant Height (ms)
1	South Bay MI	839	15.0
2	Parris Island Cos	1070	33.0
3	South Bay MI	852	12.7
4	Parris Island Cos	1022	33.0

The project was designed to evaluate the harvest period of the two varieties of lettuce. More investigation will be carried out in 1989.



REGIONAL BEDDING PLANT TRIALS

A.W. Currie

ABSTRACT: 25 species of bedding plant cultivars were evaluated during the spring and summer of 1988 at the New Brunswick Horticultural Center located in Hoyt. Pack and field evaluations were conducted on plant height, diameters of flowers, amount of bloom, and trueness to type. From these readings, plants were rated according to scores appointed during the observation periods.

ESSAIS RÉGIONAUX SUR LES PLANTS DE REPIQUAGE

Résumé: Au cours du printemps et de l'été de 1988, on a évalué 27 espèces de cultivars de plants de repiquage au Centre horticole de Hoyt (N.-B.). Les évaluations faites dans les cultures en caissettes et aux champs s'appliquaient à la hauteur des plantes, au diamètre des fleurs, à la densité de la floraison et à la pureté du type. D'après les résultats, les plantes ont été classées selon les notes accordées pendant les périodes d'observation.

INTRODUCTION: These trials are a collaboration between all four Atlantic provinces. The goal was to screen all plant material and identify the exceptional cultivars. This enables the producer and consumer the opportunity to purchase the best plant material available.

Pack evaluations were carried out prior to transplantation (June 10). Field evaluations were carried out August 4. All plants were grown in 806 containers except geraniums, in that case, 4 inch plastic pots were used.

All measurements are in millimeters. Ratings in table 1 are a total out of 5, in table 2 they are out of 50.

Seeds were obtained from the following seedsmen. Coded as follows:

- A. All American Selections
- B. Western Horticulture Specialists Ltd.
- C. Stokes Seeds
- D. W.H. Perron Ltd.
- E. Ball Superior Ltd.
- F. J.V.K. Ltd.
- G. Bodger Seeds

TABLE 1: PACK EVALUATION

Variety	Height	% Flowering	Diameter of Flower	Evenness of Growth	Foliage Appear
<u>Marigolds</u>					
Spry Boy	190	60	30	4	5
Bonanza Gold	190	80	30	4	4
Hero Flame	210	90	50	4	4
Aurora Fire	230	70	50	4	4
Disco Golden					
Yellow	230	70	40	3	5
Hero Harmony	170	70	40	4	4
Little Devil					
Yellow	160	90	30	4	5
Disco Red	240	90	40	4	4
Disco Orange	230	80	40	4	4
Disco Mix	220	80	40	3	4
Janie Flame	180	80	40	4	4
Little Devil					
Fire	120	100	30	5	5
Little Devil					
Orange	160	90	40	4	4
Lemon Drop	160	50	20	4	3
Perfection Gold	240	0	0	4	4
Inca Orange	210	0	0	5	4
Janie Golden					
Orange	130	90	30	5	4
French Candy	200	10	30	4	4
Bonanza Orange	160	70	90	3	4
Hero Flame	160	70	40	5	4
Giant Sunshot	260	0	0	4	5
Hero Red	180	70	30	3	4
Hero Yellow	160	80	40	4	4
Early Spice					
Saffron	210	90	50	3	4
Orange Boy	220	70	30	4	4
Golden Lady	250	0	0	4	4
Janie Bright					
Yellow	180	100	30	4	4
Bonanza Harmony	230	70	40	3	4
Hero Gold	180	70	30	3	4
Yellow Boy	180	90	30	3	4
Golden Boy	190	70	30	5	4
Petite Yellow	160	30	30	4	3
French Candy	160	0	0	4	3
Orange Galore	130	0	0	4	4
Discovery					
Yellow	90	0	0	3	4
Gold Galore	140	0	0	3	4
Moonshot	160	0	0	4	4
Yellow Galore	110	0	0	5	4
First Lady	140	0	0	5	4
Orange Lady	160	0	0	4	4
Bonanza Flame	160	80	40	4	4
Early Spice					
Orange	180	60	40	4	4
Sophia Mix	190	60	40	3	4
Cabaret Orange	190	5	50	4	4
Aurora Gold	200	80	40	5	4
Early Spice					
Ginger	170	70	50	4	4
Harmony Boy	130	70	50	4	4
Bonanza Yellow	160	80	40	3	4

Golden Gate	210	80	40	3	4
Hero Red	190	80	40	3	4
Pumpkin Crush	130	0	0	4	3
Bonanza Spray	200	70	40	3	4
Little Devil					
Bicolor	170	80	30	4	4
Perfection					
Yellow	250	0	0	4	4
Inca Yellow	230	0	0	4	3
Perfection					
Orange	260	0	0	3	4
Voyager Yellow	220	0	0	4	4
Hero Gold	180	70	40	3	5
Disco Marietta	200	60	40	3	4
Double Pineapple					
Crush	170	0	0	4	5
Janie Harmony	220	80	40	4	5
Glowing Embers	220	50	40	4	4

Dahlia

Picotte	150	0	0	5	5
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Ageratum

Madison	110	80	20	5	5
Pacific					
Imperial	170	80	10	5	5
Adriatic					
Improved	200	80	10	5	5
Snowball	110	80	10	5	5

Chrysanthemum

Snowlady	100	0	0	5	5
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Salvia

White Victoria	150	0	0	5	5
Mini Victoria	140	0	0	5	5
Fire and Ice	130	60	40	5	5

Lobelia

Blue Moon	60	95	5	5	5
Blue Crystal	70	99	5	5	5

Snapdragon

Princess White	140	70	10	3	4
With Purple Eye					
Tahiti Mix	140	80	20	4	4
Sonnet Mix	30	0	0	5	5
Princess Yellow					
with Red Eye	20	0	0	5	5

Gazania

Daybreak	130	70	50	4	5
Mini Star White	120	0	0	5	5
Mini Star					
Yellow	140	0	0	5	5
Mini Star					
Tangerine	100	0	0	5	5

Dianthus

Telestar					
Picotee	110	80	30	4	4
<u>Geranium</u>					
Pinwheel Salmon	180	0	0	4	3
Rose Diamond	170	80	90	4	4
Ringo Scarlet	130	0	0	4	3
Applause	100	80	80	3	4
Salmon Elite	140	20	70	5	5
Tiffany Red	140	0	0	3	3
Orbit Violet	140	0	0	5	5
Apple Blossom					
Orbit	150	10	80	4	4
Sundance	120	0	0	5	4
Ice Queen	140	20	70	4	4
Pinto Rose	140	0	0	3	4
Pinwheel Bright					
Rose	130	0	0	4	4
Scarlet Eye	150	0	0	5	5
Ringo White	90	0	0	4	4
Pinwheel Red	140	0	0	3	3
Pinto Salmon	120	20	100	3	3
Sprinter Red	130	0	0	5	5
Neon Rose	140	0	0	4	3
Pink Elite	130	10	80	3	3
Pinwheel					
Scarlet	110	0	0	4	3
Orbit Glow	130	0	0	4	3
Express Red	150	0	0	5	5
New Dawn	150	10	70	4	4
Mystic	160	20	80	4	4
Orbit Pink	130	0	0	3	3
Picasso	140	0	0	4	5
Pinto Blush	150	0	0	5	5
White Orbit	140	0	0	5	5
Pinto Red	140	0	0	3	3
Ringo Rose	150	10	90	4	3
<u>Verbena</u>					
Amethyst Mid					
Blue	110	0	0	4	4
Sparkle Crystal	80	0	0	5	5
Salmon Rose	70	0	0	3	4
Sparkle Blaze	40	0	0	3	2
Showtime Bell	40	0	0	4	4
Splendor	40	0	0	3	4
Sand White	40	0	0	3	4
Romance White	40	0	0	2	3
Romance Violet	70	0	0	4	4
Dwf Sparkle	80	0	0	4	4
Derby Scarlet	70	0	0	4	4
Derby Rose Pink	100	0	0	5	5
Romance Burgandy 50	0	0	2	3	
Trinidad	60	0	0	4	4
Tropic	70	0	0	4	4
DeepBlue White					
Eyes	40	0	0	3	4
Derby Coral	80	0	0	5	5
<u>Petunia</u>					
Daddy Mixed	130	80	100	4	4
Ricochet	190	80	70	4	4
Astro	130	80	80	4	3
Cherry Frost	90	70	80	5	5

Purple Pirouette 70	60	90	5	5	
Fandango	130	70	85	4	4
Crusader	170	60	60	4	4
All Star	140	70	75	3	3
Viva	200	80	75	4	4
Rose Pictee	130	70	80	4	4
Blue Frost	190	60	45	4	4
Ultra Rose Star	150	70	80	4	4
Fire Frost	50	0	0	5	5
Penny Candy	170	70	60	4	4
Midnight Star	160	80	60	3	3
Gay Paris	180	70	85	3	4
Blue Picotee	90	80	80	4	4
Blue Eclipse	80	0	0	5	0
Cherry Frost	110	90	60	4	5
Sunwheel Titan	100	0	80	3	4
Ultra Crimson Star	100	60	0	4	4
Rose Picotee	110	0	0	4	4
Cherry Frost	110	0	0	5	5
Fire Frost	70	0	0	5	4
Cavalier	60	0	0	5	5
Kandy Kane	130	70	70	3	3
Orchid Daddy	110	100	100	5	5
Burgundy Eclipse	130	80	80	4	4
Red Picotee	100	70	80	2	3
Midnight Star	100	60	60	3	3
Dancing Lady	130	70	70	4	3
Penny Candy	90	770	100	3	4
Ultra Crimson Star	130	70	90	3	4
Ultra Rose Star	150	60	80	4	3
Ultra Red Star	140	80	90	4	4
Starburst	150	70	80	4	4
Red/White Flash	130	90	90	5	4
Calypso	150	70	80	4	4
Velvet Picotee	120	0	0	4	4
Cherry Frost	160	70	85	4	5
Telstar	200	80	80	4	4
Falcon Red & White	180	80	90	4	4

Zinnia

King of Hearts	190	0	0	5	5
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Alyssum

Snow Crystal	40	100	5	5	5
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Sanvitalia

Mandarin Orange	170	60	15	5	5
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Vegetables

Tomato- Celebrity	130			5	5
Peppers					
Mexi Bell	80			3	4
Super Chili	70			4	4
Pumpkin Autumn Gold	310			4	5
Cucumber					
Salad Bush	130			5	5
Lettuce					

Red Sails	100	4	4
Okra			
Burgundy	110	3	4
Basil			
Purple Ruffles	80	5	5

TABLE 2: FIELD EVALUATION

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
<u>Petunia</u>					
All Star	200	190	60	50	B
Astro	140	230	60	50	F
Blue Eclipse	330	300	60	50	F
Blue Frost	230	170	60	50	C
Blue Picottee	160	180	60	50	C
Burgundy Eclipse	170	300	70	50	F
Calypso	200	200	60	50	C
Cavalier	240	200	75	50	B
Cherry Frost	200	170	60	50	D
Crusader	200	215	65	50	F
Dancing Lady	170	195	60	50	E
Fandango	160	180	55	50	B
Falcon Red/White	200	190	60	50	F
Falcon Rose/White	250	70	50	F	
Fire Frost	150	190	50	50	C
Gay Paris	230	170	80	50	C
Kandy Kane	270	190	60	50	F
Midnight Star	220	150	60	50	E
Dancing Lady	170	195	60	50	E
Penny Candy	180	180	55	50	E
Midnight Star	120	155	60	50	E
Cherry Frost	200	170	60	50	D
Ultra Rose Star	140	170	60	50	F
Ricochet	130	200	60	50	F
Red Picottee	450	190	65	50	C
Velvet Picottee	130	300	70	50	C
Ultra Crimson					
Star	170	180	65	50	C
Ultra Red Star	200	150	65	50	C
Starburst	160	220	60	50	C
Telstar	260	160	60	50	C
Red/White Flash	180	300	80	50	C
Rose Picottee	170	190	60	50	B
Sunwheel Titan	220	300	70	50	B
Viva	160	260	60	50	C
Daddy Mixed	220	210	65	49	C
<u>Geranium</u>					
Red Elite	300	400	100	47	E
Scarlet Eye					
Orbit	280	400	90	46	D
New Dawn	250	350	80	45	E
Ice Queen	310	350	70	45	F
Sundance	300	400	100	45	D
Ringo Violet	360	400	90	45	E
Pink Elite	250	400	80	45	E
Orbit White	250	350	70	45	D
Pinto Red	280	400	80	45	B
Appleblossom					
Orbit	280	350	90	45	D
Ringo Scarlet	250	400	80	45	E

Pinto Blush	270	400	95	45	B
Orbit Glow	220	300	80	45	D
Ringo Rose	360	400	90	44	B
Tiffany	350	400	105	49	D
Pinto Salmon	300	350	80	44	B
Mystic	280	350	85	44	E

Marigolds

Orange Lady	400	390	80	48	C
Disco Marietta	350	310	50	48	G
Golden Boy	300	250	40	48	C
Hero Red	250	210	60	47	G
Bonanza Flame	250	290	40	47	B
Bonanza Harmony	360	420	50	47	B
Orange Boy	300	450	40	47	C
Pumpkin Crush	260	280	90	47	E
Disco Golden					
Yellow	320	500	50	47	G
Earl Spice					
Saffron	290	400	60	46	C
Aurora Fire	300	300	60	46	B
Hero Harmony	290	310	60	46	G
Hero Flame	240	320	50	46	G
French Candy	350	290	60	46	C
Pineapple Crush	300	210	80	46	E
Glowing Embers	300	370	50	46	B
Hero Gold	290	410	60	47	B
Bonanza Orange	320	310	50	45	B
Bonanza Yellow	270	400	50	45	B
Discovery					
Yellow	546	340	70	45	C
Harmony Boy	300	310	40	45	C
Sophia Mixed	330	300	60	45	G
Little Devil					
Yellow	200	170	40	45	E
Disco Red	290	370	40	45	G
Early Spice					
Orange	270	310	50	45	E
Hero Red	300	300	50	45	B
Little Devil					
Orange	250	410	40	45	E
Janie Flame	250	300	50	45	B
Spry Boy	280	300	50	44	C
Lemon Drop	300	350	40	44	B
Early Spice					
Ginger	250	270	50	44	C
Janie Bright					
Yellow	260	230	50	44	B
Little Devil					
Bicolour	200	320	40	44	E
Bonanza Spray	270	300	50	44	B
Janie Golden					
Orange	210	370	40	44	B
Janie Harmony	280	250	50	43	B
Aurora Gold	300	150	60	43	B
Perfection					
Orange	500	400	70	43	D
Hero Yellow	260	230	50	43	B
Cabaret Orange	300	290	40	43	F
Petite Yellow	300	310	40	43	C
Orange Galore	450	450	80	42	C
Yellow Boy	280	310	40	42	C
Bonanza Gold	260	360	50	42	B
Disco Mix	270	250	40	42	G
Little Devil					
Fire	160	220	50	41	E

Moonshot	340	350	60	41	C
Yellow Galore	370	350	80	41	C
Disco Orange	310	300	50	40	G
Voyager Yellow	470	300	50	40	E
Giant Sunshot	350	210	70	39	D
Perfection					
Yellow	440	240	60	39	C
Perfection Gold	570	420	80	39	D
Golden Lady	520	370	80	39	B
First Lady	480	360	50	38	C
Inca Yellow	500	530	90	37	D
Gold Galore	530	490	70	36	C

Verbena

Showtime Bell	90	250	10	50	F
Derby Rose Pink	180	180	20	49	B
Salmon Rose	180	180	15	48	F
Yrinidad	190	170	20	46	D
Romance Burgundy	150	160	15	46	D
Tropic Mixed	180	350	20	45	D
Derby Coral	170	210	20	45	F
Romance Violet	90	190	10	44	D
Romance White	100	140	20	44	D
Amethyst Mid					
Blue	150	240	20	41	D
Dwarf Sparkle	110	180	20	30	D
Spendor	130	250	15	30	B
Derby Coral	170	210	20	30	F
Sparkle Crystal	110	160	20	30	F
Sparkle Blaze	130	200	20	30	F

SPRING WHEAT CULTIVAR EVALUATION TRIAL

D.F. Walker and A.O.M. Smith

ABSTRACT: Five spring wheat and two triticale cultivars were seeded on May 10 in the R.C.B. design with 4 replications. Row spacing was 12 cm and the seeding rate was 200 viable kernels per meter sq. All plots were harvested on August 19.

The highest yielding cultivar was Belvedere at 2.9 T/ha, followed by CT3 at 2.9 T/ha, and Messier at 2.8 T/ha. Two milling wheat varieties, Max and Katepwa, yielded 2.7 and 2.1 T/ha respectively.

ESSAI D'ÉVALUATION DE CULTIVARS DE BLÉ DE PRINTEMPS

Résumé: Cinq cultivars de blé de printemps et deux cultivars de triticale ont été semés le 10 mai dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. Le taux d'ensemencement était de 200 grains viables par mètre carré, et l'espacement était de 12 cm entre les rangs. Toute la récolte a eu lieu le 19 août.

Le cultivar Belvedere a donné le meilleur rendement (2,9 t/ha), suivi des cultivars CT3 (2,9 t/ha) et Messier (2,8 t/ha). Les deux variétés de blé de meunerie Max et Katepwa ont donné des rendements de 2,7 et 2,1 t/ha respectivement.

INTRODUCTION: A new dimension was added to the cereal industry in 1987 and is continuing in 1988 with the initiation of commercial milling wheat production. Max is the only cultivar currently recommended but the Western wheat Katepwa is being evaluated.

This study was undertaken to assess the performance of 2 milling wheats, 2 triticales, and 3 feed wheats.

MATERIALS AND METHODS: Five wheat and two triticale cultivars were seeded in the R.C.B. design with 4 reps. on May 10 (Table 1). The seeding rate was 200 viable kernels/m² with a row spacing of 12 cm. Prior to seeding, 300 kg/ha of 15-15-15 was broadcast and incorporated. Ammonium Nitrate was applied at G.S. 30-34 at a rate of 60 kg N/ha. Tilt (125 g ai/ha), Cycocel (175 g ai/ha), and Blagal (840 g ai/ha) were applied as a tank mixture at G.S. 20-23. The Belgium Scale was used to record lodging prior to harvest. A Hege 125 B combine was used to harvest the plots on August 19.

RESULTS AND DISCUSSION: Wheat yields both at the commercial and plot level were lower in 1988 than in 1987. This was due to dry conditions in the early part of the growing season and damp conditions causing disease during the last half of the growing season. The above normal heat unit conditions received during the growing season hastened the maturity of all cultivars by 9 to 13 days. The trial was planted on May 10 and harvested on August 19. The period from planting to harvest was 101 days. Normally, wheat and triticale require 110 to 114 days to reach maturity (Field Crop Guide, 1988). The

compressed growing season would have forced the cultivars through their growth stages quicker. These conditions combined to cause all components of yield: T.K.W., heads/m² and kernels/head, to be lower in 1988 compared to 1987 (Duivenvoorden and Walker, 1987). With comparable varieties, T.K.W., heads/m² and kernels/head were reduced by 24.5, 15.1 and 12.5 % respectively.

All cultivars, with the exception of Katepwa, did not have significant yield difference (Table 1). Katepwa, similar to all Western Canadian cultivars, performs poorly in an Eastern environment. In order of ranking, Belvedere the most widely grown commercial cultivar and the triticale line CT3, had the highest yields. These two cultivars were also among the highest yielding cultivars of 1987 (Duivenvoorden and Walker, 1987).

Messier and AW 117, two feed wheats, had yields of 2.8 and 2.6 T/ha respectively. These two wheats do have merit but because of lower yields it is doubtful if they will be added to the recommended list.

Max, the other milling wheat cultivar in the trial, yielded 2.7 T/ha, significantly higher than Katepwa at 2.1 T/ha.

CONCLUSIONS: Yields of all wheat and triticale cultivars were low in 1988 compared to 1987. A number of environmental conditions including: above normal heat units, a compressed growing season, and disease pressure were responsible for the lower yields.

Belvedere is the highest yielding feed wheat and should become the choice of most growers in 1989. AW117 is an unregistered line from the Charlottetown program. It is doubtful if this line will be registered due to its low yield and similar agronomic characteristics to Belvedere. Messier is a good variety; however, lower yielding than Belvedere. There is some question as to whether it should be added to the recommended list. CT3 should receive its registration in 1989 and then be added to the recommended list in 1990. CT3's only weakness is its late maturity.

REFERENCES: Duivenvoorden, C.J. and Walker, D.F. 1987. Spring Wheat Cultivar Evaluation Trial. Adaptive Research Reports, N.B. Department of Agriculture. 9:68-71.

Field Crop Guide to Variety and Pesticide Selection. 1988. Publication No. 100 A, Page 8.

ACKNOWLEDGEMENTS: The authors would like to thank Gerald Springer for providing plot land.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF SPRING WHEAT CULTIVAR EVALUATION TRIAL, HARTLAND, N.B. 1988

Cultivar	Yield (T/ha)	T.K.W. (g)	Lodging at Harvest*	Heads /m ²	Kernels /Head
Belvedere	2.9	31.0	2.7	340	33.6
CT3	2.9	39.2	0.4	292	30.8
Messier	2.8	29.9	0.8	342	30.2
Max	2.7	30.2	0.9	340	32.0
AW 117	2.6	30.8	1.8	367	32.7
Beaguelita	2.5	35.4	0.2	359	32.8
Katepwa	2.1	29.9	0.9	369	18.6
Lsd (.05)	.57		.96	59.1	4.7
C.V. (%)	14.61		60.90	11.56	10.43

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged.

OAT CULTIVAR EVALUATION STUDY

D.F. Walker and A.O.M. Smith

ABSTRACT: Seven normal and two hull-less cultivars of oats were seeded on May 10 in the RCB design with 4 replications. Seeding rate was 200 viable kernels per meter sq. with a row spacing of 12 cm. Plots were harvested on August 19 with a Hege 125 B combine.

The three Quebec oats: QO 224-5, QO 237-3, and QO 220-13 yielded highest with 4.4, 4.2, and 3.9 T/ha resp. Tibor and 03669, the hull-less oats, had the lowest yields at 2.7 and 2.4 T/ha resp. Thousand kernel weights ranged from 30.6 g for QO 224-5 to 36.2 g for Marion. The two highest yielding cultivars also had stronger straw.

ÉTUDE D'ÉVALUATION DE CULTIVARS D'AVOINE

Résumé: Sept cultivars d'avoine ordinaire et deux cultivars d'avoine à grains nus ont été semés le 10 mai dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. Le taux d'ensemencement était de 200 grains viables par mètre carré, et l'espacement était de 12 cm entre les rangs. La récolte a été faite le 19 août avec une moissonneuse Hege 125B.

Les trois variétés d'avoine Québec ont donné les meilleurs rendements, soit la QO 224-5 (4,4 t/ha), la QO237-3 (4,2 t/ha) et la QO 220-13 (3,9 t/ha). Les deux cultivars d'avoine à grains nus Tibor et 03669 ont eu des rendements inférieurs correspondant à 2,7 et 2,4 t/ha respectivement. Le poids de mille grains variait de 30,6 g pour l'avoine QO 224-5 à 36,2 g pour l'avoine Marion. Les deux cultivars ayant obtenu le meilleur rendement avaient également les tiges les plus fortes.

INTRODUCTION: Human nutrition studies have indicated that oats are very beneficial in the human diet, preventing or in some cases reducing the effect of disease. Because of this, the interest in and the consumption of oats has increased. The price of oats is also high relative to other grains.

Interest in hull-less oats has intensified. Hull-less oats retain the desirable agronomic characteristics of conventional oats and should be more readily marketable. Hulls are released during the threshing operation and the resulting naked kernel represents a condensed, high quality food and feed product.

This study is a continuation of previous studies in order to evaluate the yield and agronomic characteristics of 7 conventional and 2 hull-less oats.

MATERIALS AND METHODS: Seven conventional and two hull-less oat cultivars were seeded on May 10 at Hartland, N.B. in the RCB design with 4 replications (Table 1). The plots were 2 x 8.5 m with a row spacing of 12 cm and a seeding rate of 200 viable kernels per meter sq. Prior to seeding, 300 kg of 15-15-15 was broadcast and incorporated and 60 kg N/ha was applied at G.S. 33-34 using Ammonium Nitrate as the fertility source. A tank mixture of Blagal (840 g ai/ha), Tilt (125 g ai/ha) and Cycocel (175 g ai/ha) was applied with a small plot

sprayer at G.S. 22-24. Lodging ratings were taken at harvest which was performed on August 19 with a small plot combine. Yield and yield components were recorded after harvest.

RESULTS AND DISCUSSION: The three new lines: QO 224-5, QO 237-3, and QO 220-13 have superior yields to the four recommended cultivars: Sentinel, Shaw, Nova and Marion (Table 1). The lines QO 224-5 and QO 237-3 also have superior lodging resistance to the other recommended cultivars with the exception of Sentinel. The superior yield of QO 224-5 could be due to its very high head population.

The yields of 1988 were lower than in 1987 (Duivenvoorden et al 1987). This could be due to a lower seeding rate and dry conditions in the early part of the growing season which could have reduced tiller production and overall head population.

The two hull-less lines, Tibor and O3669, had significantly lower yields than any of the hulled lines. Duivenvoorden et al found similar results in 1987 (Duivenvoorden et al. 1987) The lower yields appear to be due to a significantly lower number of kernels/head as the other two components of yield, T.K.W. and heads/m² are similar to the hulled lines (Table 1).

CONCLUSIONS: The two lines, QO 224-5 and QO 237-3, have superior yield and lodging resistance compared to the currently recommended varieties. These two lines have excellent agronomic traits and should be added to the recommended list as soon as they are registered and seed supply is adequate.

REFERENCES: Duivenvoorden, C.J., Walker, D.F., and Bamford, B.A., 1987. Oat Cultivar Evaluation Trial, Adaptive Research Reports. N.B. Department of Agriculture. 9:72-74.

ACKNOWLEDGEMENTS: The authors extend thanks to Gerald Springer for providing plot land.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF OAT CULTIVAR EVALUATION TRIAL. HARTLAND, N.B. 1988

Cultivar	Yield (T/ha)	Thousand Kernel Weight(g)	Lodging at Harvest*	Heads /m ²	Kernels /Head
QO 224-5	4.4	30.6	3.4	341	42.9
QO 237-3	4.2	35.3	3.1	285	52.4
QO 220-13	3.9	32.2	5.4	290	57.1
Sentinel	3.7	35.2	3.9	315	41.4
Shaw	3.5	30.7	6.8	287	52.0
Nova	3.5	31.9	5.5	250	62.5
Marion	3.4	36.2	6.1	269	46.1
O3669	2.7	30.9	3.8	333	26.1
Tibor	2.4	31.6	0.4	286	25.5
Lsd. (.05)	.52		2.84	53.77	12.91
C.V. (%)	10.15		45.80	12.47	19.61

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged.

BARLEY CULTIVAR EVALUATION TRIAL

D.F. Walker and A.O.M. Smith

ABSTRACT: A comparative study was conducted on seven feed barley cultivars in the R.C. B. design with 4 replications. The plots were seeded in Hartland, N.B. on May 10 and harvested on August 11.

Highest yields, 4.6, 4.4 and 4.4 T/ha were produced by cultivars: Cadette, OB 621.4, and Chapais resp. Leger, the most widely grown cultivar in N.B., yielded 4.2 T/ha. All cultivars except Chapais (1.5) were severely lodged with ratings higher than 6.0 on the Belgium scale. Yields in 1988 were lower than in 1987 due mainly to a slightly lower head population and thousand kernel weight.

ESSAI D'ÉVALUATION DE CULTIVARS D'ORGE

Résumé: Une étude comparative a été menée sur sept cultivars d'orge dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. Les parcelles ont été ensemencées à Hartland (N.-B.) le 10 mai, et la récolte a eu lieu le 11 août.

Les meilleurs rendements ont été obtenus par les cultivars Cadette (4,6 t/ha), OB 621.4 (4,4 t/ha) et Chapais (4,4 t/ha). Le cultivar Léger, la variété d'orge la plus cultivée dans la province, a donné un rendement de 4,2 t/ha. Tous les cultivars ont été gravement touchés par la verse et ont enregistré des lectures de plus de 6 à l'échelle Belgium, sauf la variété Chapais (1,5). Les rendements ont été moins bons en 1988 qu'en 1987, surtout en raison d'un moins grand nombre de plants au mètre carré et du poids inférieur de mille grains.

INTRODUCTION: Barley remains an important crop in N.B. It is the most short seasoned cereal and fits very well into rotations with crops such as potatoes. It can be seeded as soon as fields can be worked and is usually ready for harvest by mid-August before potato crops are mature. The introduction of new cultivars and new management techniques in recent years has allowed producers to regularly realize yields in excess of 5.5 T/ha. Leger, the current favourite, has high yield potential and good disease resistance. Breeding programs continue to develop new cultivars with greater yielding ability and improved straw strength.

This study was conducted to evaluate and compare the performance of 8 feed barley cultivars.

MATERIALS AND METHODS: Seven barley cultivars were seeded at Hartland, N.B. on May 10 (Table 1). A plot seeder with 12 cm row spacing was used to seed the plots at a rate of 200 viable kernels per meter square. Plot design was the RCB with 4 reps. The fertilizer, 15-15-15, was broadcast and incorporated prior to seeding at a rate of 300 kg/ha. At G.S. 33-34, an additional 60 kg N/ha as 34-0-0 was applied with a cyclone spreader. A tank mixture of Cycocel (175 g ai/ha), Tilt (125 g ai/ha) and Blagal (840 g ai/ha) was applied to all plots at G.S. 22-26. The Belgium Lodging Scale was used to record lodging ratings before harvest. All plots were harvested with a Hege 125 B combine on August 11.

RESULTS AND DISCUSSION: Barley yields both at the plot and farm level were lower in 1988 than in 1987 (Duivenvoorden & Walker, 1987). This was due to a combination of dry conditions during the early part of the growing season, possibly causing reduced tillering and to excessive moisture towards the end of the season causing disease, lodging, and harvest difficulties. The highest yielding cultivars were: Cadette (4.6 T/ha), Chapais (4.4 T/ha) and OB 621.4 (4.4 T/ha). Leger, the most widely grown barley in N.B., yielded 4.2 T/ha (Table 1).

All cultivars, except Chapais (1.5), were severely lodged with ratings higher than 6.0 on the Belgium Lodging Scale. Both the superior yielding ability and straw strength of Chapais and the superior yielding ability of Cadette will enable these cultivars to replace Leger as the most widely grown barleys in N.B.

CONCLUSIONS: Chapais and Cadette are continuing to show superior yield and lodging resistance compared to Leger. These two traits, particularly for Chapais, indicate that they will replace Leger as the most popular commercial cultivars.

REFERENCES: Duivenvoorden, C.J. and Walker, D.F. 1987. Barley Cultivar Evaluation Trial. Adaptive Research Report, N.B. Department of Agriculture. 9:85-87.

ACKNOWLEDGEMENTS: Thanks is extended to Gerald Springer for providing land for this study. Appreciation is also extended to B.A. Bamford.

TABLE 1: YIELD AND AGRONOMIC DATA OF BARLEY CULTIVAR EVALUATION TRIAL. HARTLAND, N.B. 1988

Cultivar	Yield (T/ha)	T.K.W. (g)	Lodging at Harvest*	Heads /m ²	Kernels /Head
Cadette	4.6	36.5	8.8	319	48.0
Chapais	4.4	40.3	1.5	375	35.7
OB 621.4	4.4	34.4	8.3	416	40.0
OCF 81.248	4.2	34.0	6.1	397	40.9
Leger	4.2	36.8	7.4	302	49.6
AB 94.11	4.1	41.2	8.8	532	21.0
Rodeo	3.5	38.0	9.0	509	21.2
LSD (.05)	.34		1.85	93.68	3.61
C.V.(%)	5.38		17.53	15.48	6.64

*Belgium Lodging Scale 0.2 = erect; 9.0 = totally lodged

MALTING BARLEY CULTIVAR EVALUATION TRIAL

D.F. Walker, A.O.M. Smith and B.A. Thibodeau

ABSTRACT: Yield and agronomic characteristics of 20 malting barley cultivars and lines were evaluated in a 4 replicate RCB study. Plots were seeded on May 10 and harvested on August 10.

Only one line, BT 308-5, achieved malting quality, grading select C.E. The remaining 19 failed to make malting grade due to low hectoliter weight and color. Yields ranged from 4.6 T/ha for BT-922-3 to 3.0 T/ha for Cytrin, FR-HJ3-FS-1 and Harrington.

ESSAI D'ÉVALUATION DE CULTIVARS D'ORGE DE MALTAGE

Résumé: Le rendement et les caractéristiques agronomiques de vingt cultivars et variétés d'orge de maltage ont été évalués dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. L'ensemencement a eu lieu le 10 mai et la récolte, le 10 août.

Seule la variété BT 308-5 répondait aux normes de qualité de l'orge de maltage et se classait dans la catégorie "Select CE". Les 19 autres variétés n'ont pas été classées comme orge de maltage en raison de leur couleur et du poids trop bas de l'hectolitre. Les rendements variaient de 4,6 t/ha pour la variété BT-922-3 à 3 t/ha pour les variétés Cytrin, FR-HJ3-FS-1 et Harrington.

INTRODUCTION: In spite of the Western Canadian and U.S. drought of 1988, the international cereal market continues to be characterized by low prices due to strong competition for markets. Maritime farmers have not been exempted from the trend. Although local grain prices have increased in the past 12 months, they are still below or at the cost of production. Even though producers are receiving low returns, provincial acreage has not declined significantly. Potato farmers in particular continue to favor oats, barley and wheat because of relative ease of production and rotational benefits. Malting barley is a high value specialty crop and has potential in N.B. It is not currently grown, but has the same rotational advantages as conventional cereals. Successful production would require more attention to crop management and harvest, but the premium prices paid for grain attaining malting grade could more than offset the costs of additional inputs. Challenges to be overcome before commercial production of malting barley can be initiated include the identification of both economically superior cultivars and management protocols.

This study was undertaken to evaluate the commercial malting potential of one local and 20 Western and European cultivars under N.B. conditions.

MATERIALS AND METHODS: Twenty malting barley cultivars and lines and 1 adapted feed barley were seeded on May 10 at Hartland, N.B. The 2 x 8.5 m plots were arranged in a 4 replicate RCB design. The trial was seeded using a Winterstieger plot seeder with a row spacing of 12 cm.

Fertilizer in the form of 15-15-15 at 300 kg/Ha was broadcast prior to seeding. Blagal (840 g ai/ha), Tilt (125 g ai/ha) and Cycocel (175 g ai/ha) were applied on June 8 G.S. 22-26. Lodging ratings using the Belgium system were taken at harvest. All plots were harvested on August 10 with a small plot combine.

Included in the test were 12 lines from Western Canada (BT), 5 lines or cultivars from Germany, two named cultivars from Western Canada and one adapted feed type. The 20 malting selections were compared against Rodeo, an adapted feed barley, for yield, yield components and lodging.

RESULTS AND DISCUSSION: In 1988, only one line, BT-308-5 achieved malting quality (TABLE 1). The remaining 19 lines and cultivars failed to make malting quality due to low test weight and color. It appears that low test weights were caused by severe early lodging preventing complete kernel filling. Poor color was due to both delayed harvest and frequent rains prior to harvest.

Yields ranged from 4.6 T/Ha for BT-922-3 to 3.0 T/Ha for Cytrin, FR-HJ3-FS-1 and Harrington. The 1988 yields were lower than in 1987 due to early lodging and possible moisture stress early in the season causing reduced tillering (Walker et al, 1987). However, malting barley yields were similar to feed barley yields in adjacent plots (Walker et al 1988). In order of ranking, 10 of the 12 BT lines had superior yields to Rodeo and the other entries in the test. It appears that the BT lines have genetically superior yield potential.

Early plant growth was characterized by short weak straw due to an apparent moisture stress. Rains at heading caused plants to be much taller than originally expected, however, straw strength did not increase accordingly. The tall, weak straw was very susceptible to lodging resulting in earlier and more severe lodging than normal.

Protein percentage was high, ranging from 14.4 to 16.8, indicating high nitrogen levels in the rooting zone. This could have been due to residual nitrogen from the dry 1987 season. The high nitrogen levels could also have attributed to excessive lodging.

CONCLUSIONS: Excessive moisture prior to harvest, a delayed harvest, and variable weather conditions during the growing season caused poor quality and low yields.

Collectively, the BT lines appear to have greater yield potential than the other entries in the trial.

TABLE 1: YIELD AND AGRONOMIC DATA OF MALTING BARLEY CULTIVARS 1988, HARTLAND, N.B.

Cultivar	Yield (T/Ha)	Grade	Thousand Kernel Weight (g)	Lodging at Harvest ³
BT 922-3	4.6	SS ¹	37.0	3.8
BT 120-5	4.4	SS	36.0	1.04
BT 631-2	4.2	SS	43.1	4.8
BT 486-3	4.1	SS	38.9	5.9
BT 490-2	3.7	SS	39.6	3.3
BT 481-3	3.7	SS	37.2	6.8
BT 495-2	3.7	SS	37.2	6.1
BT 483-3	3.6	SS	35.4	8.1
BT 492-2	3.5	hull ¹ -less	36.2	4.0
BT 308-5	3.5	SCE ²	36.8	6.1
Ursel	3.5	SS	36.7	4.9
BT 346-5	3.4	SS	33.2	8.9
Rodeo	3.3	SS	40.7	7.7
Ellice	3.3	SS	35.7	5.7
FS-JN-502	3.2	SS	38.8	5.2
BT 496-2	3.2	SS	36.6	8.8
Alexis	3.2	SS	38.9	7.4
Ultra	3.1	SS	37.4	8.1
Harrington	3.0	SS	35.1	8.5
FR-HJ3-FS-1	3.0	SS	38.7	8.2
Cytrin	3.0	SS	36.8	9.0
LSD (.05)	.65			2.5
C.V. (%)	12.99			27.61

¹ sample select

² select CE

³ Belgium Lodging Scale .2 = erect, 9.0 = totally lodged

Lodging was early and more severe than in 1987 and appeared to be strongly related to weather during the growing season.

Evaluation of the most promising cultivars and lines will continue in order to assess the long-term suitability of malting barley as a viable cropping alternative for N.B. grain farmers.

REFERENCES: 1) Walker, D.F., Duivenvoorden, C.J., and Bamford, B.A., 1987. Malting Barley Cultivar Evaluation Trial. Adaptive Research Report, N.B. Dept. of Agriculture 9:88-90.

2) Walker, D.F. Smith, A.O.M. and Thibodeau, B.A., 1988. Barley Cultivar Evaluation Trial, Adaptive Research Reports, N.B. Department of Agriculture, 10

ACKNOWLEDGEMENTS: The authors would like to thank Gerald Springer for the use of plot land and Avinash Singh and Kathy Estabrooks for their assistance.

WINTER CEREAL SEEDING RATE STUDY

D.F. Walker and A.O.M. Smith

ABSTRACT: Two winter wheat cultivars, Borden and Absolvent, and one triticale line, GWT8 (O.A.C. Trillium), were seeded at Hartland, N.B. on September 12, 1987. Seeding rates of 100-600 viable kernels/m², in increments of 100, were seeded in the RCB design with 4 reps. A tank mixture of Cycocel (460 g ai/ha) and Bucril M (560 g ai/ha) was applied at G.S. 31 (May 13, 1988). All plots were harvested on August 10, 1988.

With all three cultivars seeding rate had only a minor effect, reducing yield only slightly at the 100 seeding rate level. Lodging and winter survival were unaffected by seeding rate. There was a significantly lower head population at the low seeding rates. However, kernels/head and kernel weight tended to compensate resulting in only a slight yield reduction. Head populations were significantly increased by seeding rate.

ÉTUDE SUR DIVERS TAUX D'ENSEMENCEMENT DES CÉRÉALES D'HIVER

Résumé: Les cultivars de blé d'hiver Borden et Absolvent et le triticale souche GWT8 (O.A.C. Trillium) ont été semés le 12 septembre 1987 à Hartland (N.-B.) dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. Les six taux d'ensemencement utilisés variaient de 100 à 600 grains au mètre carré, et la différence entre chaque taux était de 100 grains au mètre carré. Un mélange de Cycocel (460 g (i.a.)/ha) et de Bucril M (560 g(i.a.)/ha) a été appliqué sur la parcelle le 13 mai 1988 au stade de croissance 31. Toute la récolte a eu lieu le 10 août 1988.

Le taux d'ensemencement n'a eu qu'un effet négligeable sur les trois cultivars, soit une très faible baisse du rendement au taux d'ensemencement le plus bas (100 grains au mètre carré). Le taux d'ensemencement n'a pas eu d'effet sur la verse et la résistance à l'hiver. Le nombre d'épis était beaucoup plus bas aux taux d'ensemencement les plus faibles. Par contre, le nombre de grains par épis et le poids des grains ont compensé cette baisse, et le rendement a très peu diminué. Le nombre d'épis a beaucoup augmenté avec la progression du taux d'ensemencement.

INTRODUCTION: Winter wheat has several advantages: high yield potential, valuable erosion control, and the spreading of seasonal work load. The question of optimal seeding rate has not yet been concretely resolved. Higher seeding rates are advocated by some, while the compensatory ability of winter wheat leads others to suggest that high rates are an unnecessary expense. In addition to effects upon yield and yield components, it has been speculated that increased seeding rates may also improve winter survival of a crop. Both snow retention and mulching effects reduce wide fluctuations in crown temperature and thus reduce mortality.

The three cultivars being evaluated in this study are Borden and Absolvent winter wheat, and OAC Trillium winter triticale. This study was undertaken to determine what seeding rates produce optimum yields, and to attempt to explain any yield difference through yield component analysis and winter survival evaluation.

MATERIALS & METHODS: Two winter wheat cultivars, Borden and Absolvent, and one triticale line, GWT8 (OAC

Trillium) were seeded at Woodstock, N.B. on September 12, 1987. Seeding rates of 100-600 viable kernels/m², in increments of 100, were seeded in the RCB design with 4 reps. On April 21, 1988, 35 kg N/ha as Ammonium Nitrate was broadcasted with a cyclone spreader. Another 60 kg N/ha as Urea was broadcast on May 17, 1988. A tank mixture of Cycocel (460 g ai/Ha) and Buctril M (560 g ai/ha) was applied at G.S. 31. All plots were harvested with a small plot combine on August 10, 1988.

RESULTS & DISCUSSION: Environmental conditions during the winter of 1987-88 were excellent for winter cereal survival. Snow cover was adequate to provide insulation from the cold and there were no periods of freezing and thawing to cause ice sheeting. Winter survival of all 3 cultivars at all seeding rates was excellent. These conclusions are contrary to those found by Walker and Duivenvoorden, 1986. The lack of agreement can be explained by the gentle winter of 1987-88.

The average yields of OAC Trillium, Borden and Absolvent were 6.01, 5.14, and 4.23 T/ha resp. Even though there were large yield differences between cultivars, components of yield (heads/plant, heads/m², kernels/head, TKW) responded in a similar manner for all cultivars.

The yield of Borden, and OAC Trillium was not significantly influenced by increasing seeding rates beyond 200 viable kernels/m² (Table 1,2). The average yield of the 200-600 seeding rate treatment was slightly higher than the 100 seeding rate treatment. The yield of Absolvent did not increase beyond 300 viable kernels/m² (Table 3). It appears that Absolvent will not respond to low seeding rates to the degree that Borden or OAC Trillium will. The lack of a large yield difference between treatments is due to the ability of the crop to adjust the components of yield. At the low seeding rates, there was both a large number of heads/plant and kernels/head compared to the higher seeding rates. This resulted in only a slight reduction in kernels/m² at the low seeding rate compared to the magnitude of the seeding rate. Plants/m² increased in proportion to the seeding rate. T.K.W. and lodging were unaffected by seeding rate for Borden and Absolvent.

There was a significant reduction in T.K.W. for OAC Trillium as seeding rate increased from 100-600 viable kernels/m². Lodging was unaffected by seeding rate.

CONCLUSIONS: There was only a slight yield response and no effect on winter survival to increasing seeding rates from 100-600 viable kernels/m² for all 3 cultivars. This does not agree with Walker and Duivenvoorden, 1986 where it was found that increasing seeding rates did improve

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF OAC TRILLIUM WINTER TRITICALE SEEDING RATE STUDY, WOODSTOCK, N.B. 1988

Seeding Rate	Yield (T/ha)	Lodging at Harvest*	TKW (g)	Plants /m ²	Heads /m ²	Kernels /head	Kernels /m ²	Winter Survival (%)
100	5.72 B	0.2	47.14	86	336.5	43.95	14789.2	100
200	6.39 A	0.2	43.42	193	458	40.33	18471.1	100
300	6.05 AB	0.2	41.72	321	425	38.72	16456.0	100
400	5.84 AB	0.2	40.19	463.5	454	36.43	16539.2	100
500	6.02 AB	0.2	43.98	472	426	36.22	15429.7	100
600	6.05 AB	0.2	39.55	518	540.5	35.53	19204.0	100
LSD (.05)	.63							
C.V. (%)	7.0		3.52	63.94	127.26	2.44		
			5.9	12.39	19.18	4.2		

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF BORDEN WINTER WHEAT SEEDING RATE STUDY.
WOODSTOCK, N.B. 1988

Seeding Rate	Yield (T/ha)	Lodging at Harvest*	TKW (g)	Plants /m ²	Heads /m ²	Kernels /head	Kernels /m ²	Winter Survival (%)
100	4.44 B	0.2	37.72	92	370	39.65	14670.5	100
200	5.10 A	0.2	38.99	166	482	34.65	16701.3	100
300	5.37 A	0.2	38.18	287	564	32.05	18076.2	100
400	5.23 A	0.2	38.76	367	634	31.53	19990.0	100
500	5.40 A	0.2	39.76	449	609	31.13	18958.2	100
600	5.30 A	0.2	37.55	528.5	676	28.90	19536.4	100
LSD (.05)	.59		2.56	64.4	158	4.61		
C.V. (%)	7.61		4.41	13.57	18.89	9.28		

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged

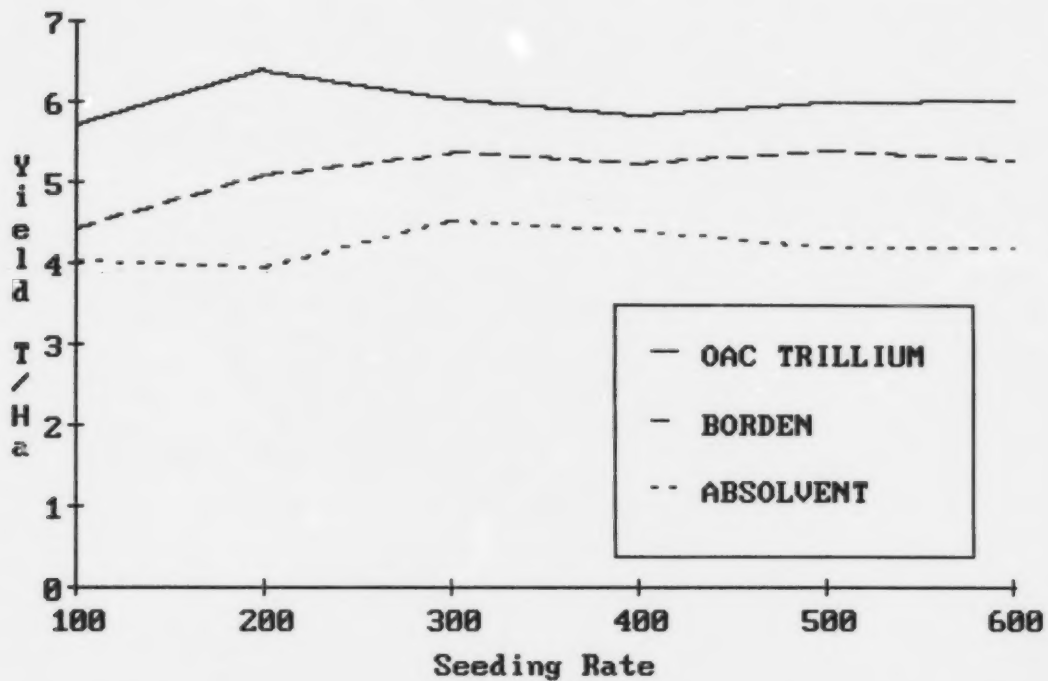


Figure 1: EFFECTS OF SEEDING RATE ON
YIELD OF WINTER CEREALS 1988

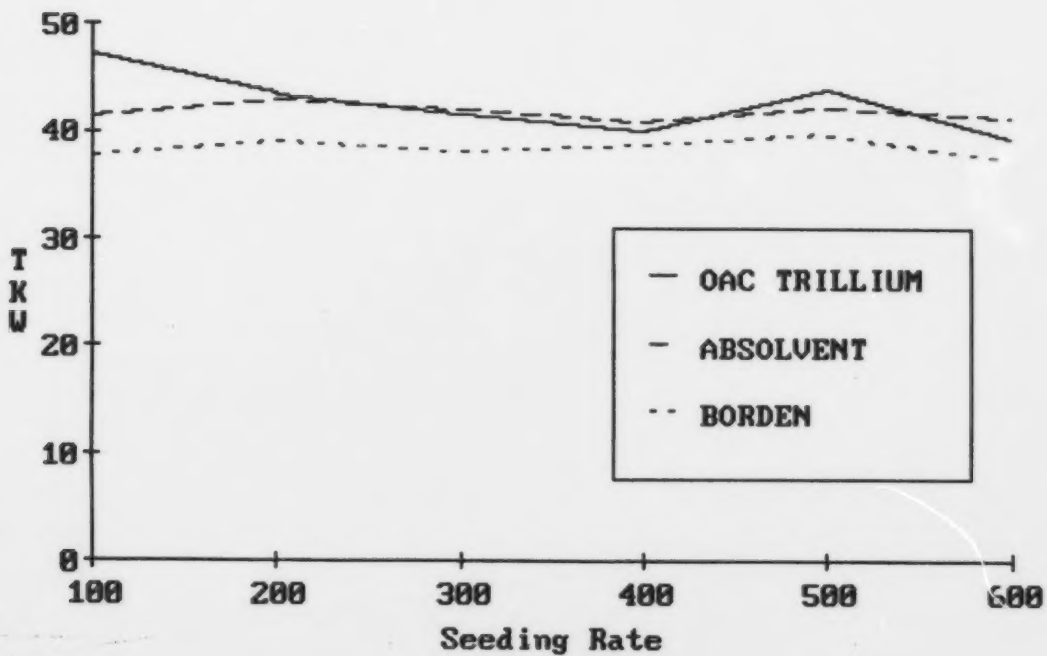


Figure 2: EFFECTS OF SEEDING RATE ON
THOUSAND KERNEL WEIGHT OF
WINTER CEREALS 1988

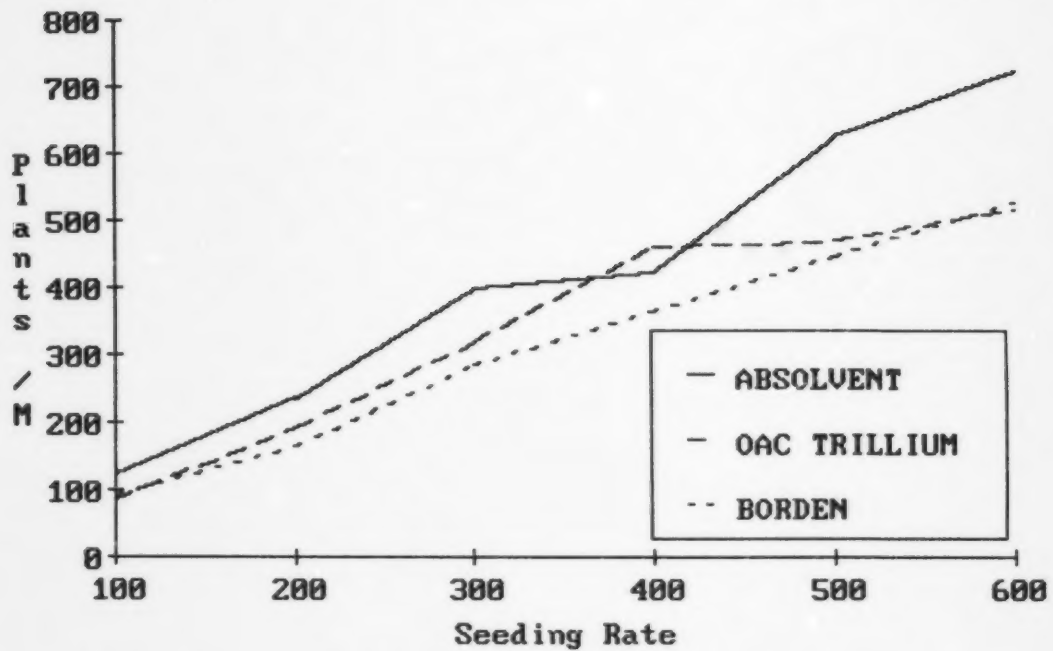


Figure 3: EFFECTS OF SEEDING RATE ON
PLANT NUMBER OF WINTER
CEREALS 1988

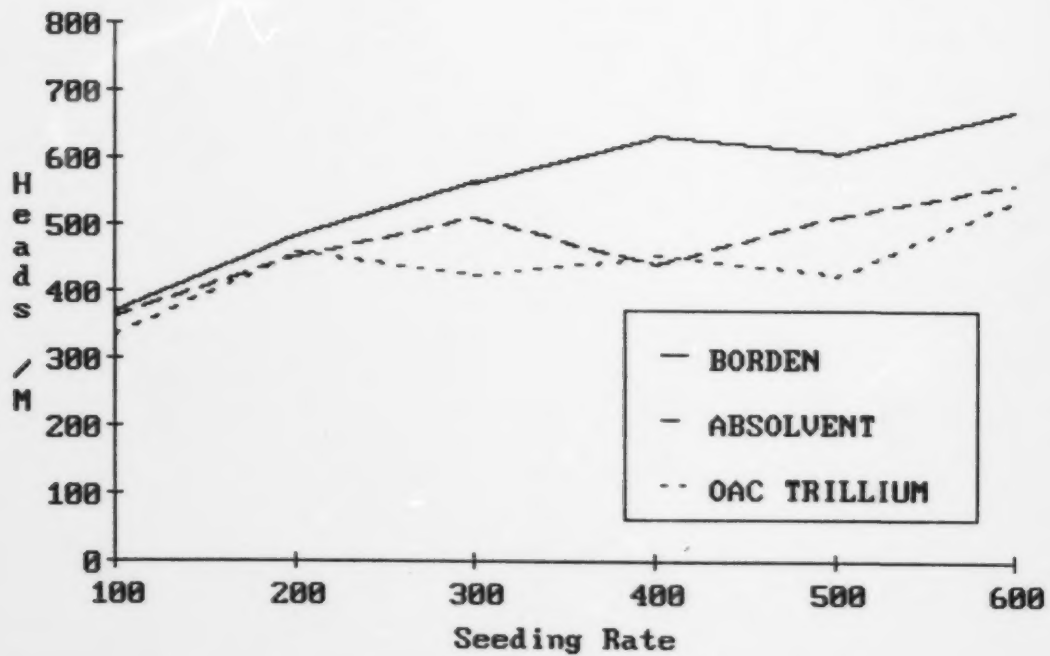


Figure 4: EFFECTS OF SEEDING RATE ON
HEAD POPULATION OF WINTER
CEREALS 1988

winter survival. The lack of response and disagreement could be due to the benign winter of 1987-88. Because of the disagreement, producers would be advised not to reduce seeding rates but to remain with the recommended seeding rate of 135 kg/ha. The effects of seeding rate and date will be examined in future studies.

REFERENCES: Walker, D.F. and Duivenvoorden, C.J. 1986. Winter Cereal Seeding Rate Study. Adaptive Research Reports, N.B. Department of Agriculture. 8:161-166.

ACKNOWLEDGEMENTS: The authors would like to thank Lorne Albright and Sons for providing plot land.

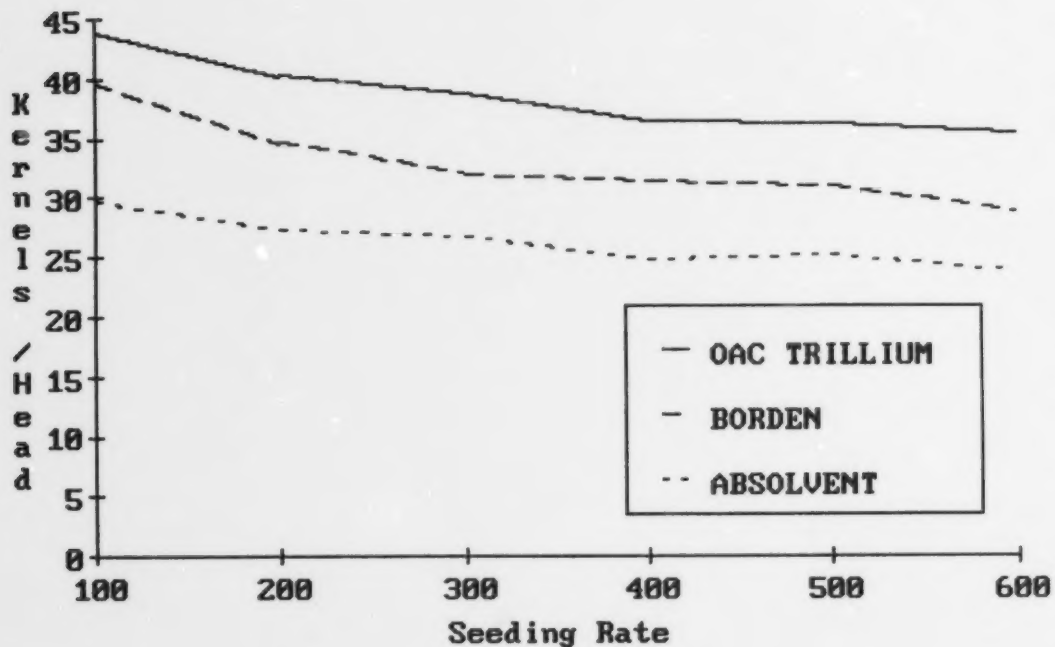


Figure 5: EFFECTS OF SEEDING RATE ON KERNELS PER HEAD OF WINTER CEREALS 1988

MAX WHEAT SEEDING RATE STUDY

D.F. Walker, A.O.M. Smith and B.A. Thibodeau

ABSTRACT: Max wheat was seeded at six rates ranging from 50-300 viable kernels per meter sq., in increments of 50, in a 4 rep. R.C.B. design on May 10. Plots were 2 x 8.5 m with a row spacing of 12 cm. All plots were harvested on August 19.

Yield, thousand kernel weight (T.K.W.) and lodging were not effected by seeding rate. There was a significant increase in plant population proportional to the seeding rate. Head populations were significantly increased by seeding rate. Heads per plant ratios ranged from 4.24 at the low seeding rate to 1.43 for the high seeding rate. Kernel number per head was inversely proportional to seeding rate ranging from 38 kernels/head at the low seeding rate to 32.28 kernels/head at the high seeding rate.

ÉTUDE DE DIVERS TAUX D'ENSEMENCEMENT DU BLÉ MAX

Résumé: Le blé Max a été semé le 10 mai dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. Les six taux d'ensemencement variaient de 50 à 300 grains viables par mètre carré, et la différence entre chaque taux était de 50 grains par mètre carré. Les parcelles mesuraient 2 m sur 8,5 m, et l'espacement entre les rangs était de 12 cm. Toute la récolte a eu lieu le 19 août.

Le rendement, le poids de mille grains et la résistance à la verse n'ont pas été touchés par le taux d'ensemencement. On a constaté que le nombre de plants augmentait avec l'accroissement du taux d'ensemencement. Le nombre d'épis augmentait en fonction du taux d'ensemencement. Le nombre moyen d'épis par plante variait de 4,24 au taux d'ensemencement le plus bas à 1,43 au taux d'ensemencement le plus élevé. Le nombre de grains par épi était inversement proportionnel au taux d'ensemencement, et il variait de 38 grains par épi au taux d'ensemencement le plus bas à 32,28 grains par épi au taux d'ensemencement le plus élevé.

INTRODUCTION: The components: head population per meter sq., kernel number per head, and kernel weight are the factors which determine grain yield. These factors can vary widely in a crop canopy. If the seeding rate is low, the plant will respond by producing more tillers/plant and a higher number of kernels/head. Conversely, if the seeding rate is high, there will generally be fewer heads/plant and fewer kernels/head. The elasticity in the components of yield allow the crop to produce approximately the same yield over a wide range of seeding rates. Each cultivar has an ideal seeding rate for a given climate.

Seeding date by rate studies have determined that the most important factor in achieving high yields of small grains is early planting (Walker et al. 1987, Walker et al. 1986). There are indications that seeding rates above 150 or 200 viable kernels per meter sq. have little effect of increasing the yield. (Walker, et al. 1987, Walker et al. 1986). Seeding rate, unlike the weather, is very easy for the grain producer to control; however, excessive seeding rates can be an unnecessary expense.

Max wheat is the first milling wheat to be commercially grown in New Brunswick. It has the potential to become

an important high value crop for grain producers. The price in Halifax for milling wheat is approx. \$265/tonne compared to feed wheat at approx. \$150/tonne.

This study was undertaken to determine the optimum seeding rate of Max Spring Wheat.

MATERIALS AND METHODS: Max wheat was seeded on May 10 at Hartland, N.B. with a Wintersteiger plot seeder. Six seeding rates of 50, 100, 150, 200, 250 and 300 viable kernels per meter sq. were seeded at a 12 cm row spacing using the R.C.B. design with 4 replications. All plots were 2 x 8.5 m. Fertility consisted of 300 kg/Ha of 15-15-15 broadcast and incorporated prior to seeding and 60 kg N/Ha as 34-0-0 was broadcast at G.S. 33-34. Stand counts were recorded at G.S. 13. On June 9, a tank mixture of Cycocel (175 g ai/Ha), Blagal (840 g ai/Ha), and Tilt (125 g ai/Ha) was applied at G.S. 22-24. The Belgium Lodging Scale was used to record lodging at harvest and head populations were taken after harvest by counting the stubble. Plots were harvested on August 19 with a Hege 125B combine.

RESULTS AND DISCUSSION: The yield of Max wheat was not significantly influenced by seeding rate; however, there was a trend of increasing yields with higher seeding rates. The lack of significance in yield can be explained by a higher head population per plant and greater number of kernels per head at the low seeding rate. Similar results were found by Walker and Duivenvoorden, 1987.

At the low seeding rate, the head population was 297 producing a head to plant ratio of 4.2, at the high seeding rate, the head population was 413, producing a head to plant ratio of 1.4. The low seeding rate had 38 kernels/head which is significantly higher than the 32 kernels/head for the high seeding rate. The number of kernels/m ranged from a low of 11,286 at the low seeding rate to a high of 13,332 for the high seeding rate (Table 1).

The highest yield of 3.42 T/Ha at the high seeding rate is 24% higher than the lowest yield of 2.74 T/Ha at the low seeding rate (Figure 1). This corresponds closely to the 18% difference in kernel number/m between the high and low seeding rate. Although there was no significant yield difference, there was a trend to higher yields at the higher seeding rates which can be attributed to an increased kernel number/m (Table 1).

Lodging and thousand kernel weights were not significantly different between treatments.

CONCLUSION: The yield of Max wheat was not significantly effected by seeding rate; however, there was a trend to higher yields at higher seeding rates. The lack of significance indicates that Max wheat has the ability to compensate for a wide range of seeding rates. The non-significant difference in yield can be explained by the higher head/plant ratio and the higher kernel number/head at the low seeding rate. The trend of increasing yields at the highest seeding rate indicates that a significant yield increase might be achieved at even higher seeding rates. This experiment will be repeated in 1989 at a higher range of seeding rates to determine if the trend of higher yields continue.

REFERENCES: Walker, D.F. and Duivenvoorden, C.J., 1987. Max Wheat Seeding Date/Rate Study. Adaptive Research Reports, N.B. Department of Agriculture. 9:61-67

Walker, D.F. and Duivenvoorden, C.J., 1986. Belvedere Spring Wheat Seeding Date/Rate Study. Adaptive Research Reports, N.B. Department of Agriculture 8:125-129.

ACKNOWLEDGEMENTS: The authors extend thanks to Gerald Springer for providing plot land. Assistance from Avinash Singh and Kathy Estabrooks was also appreciated.

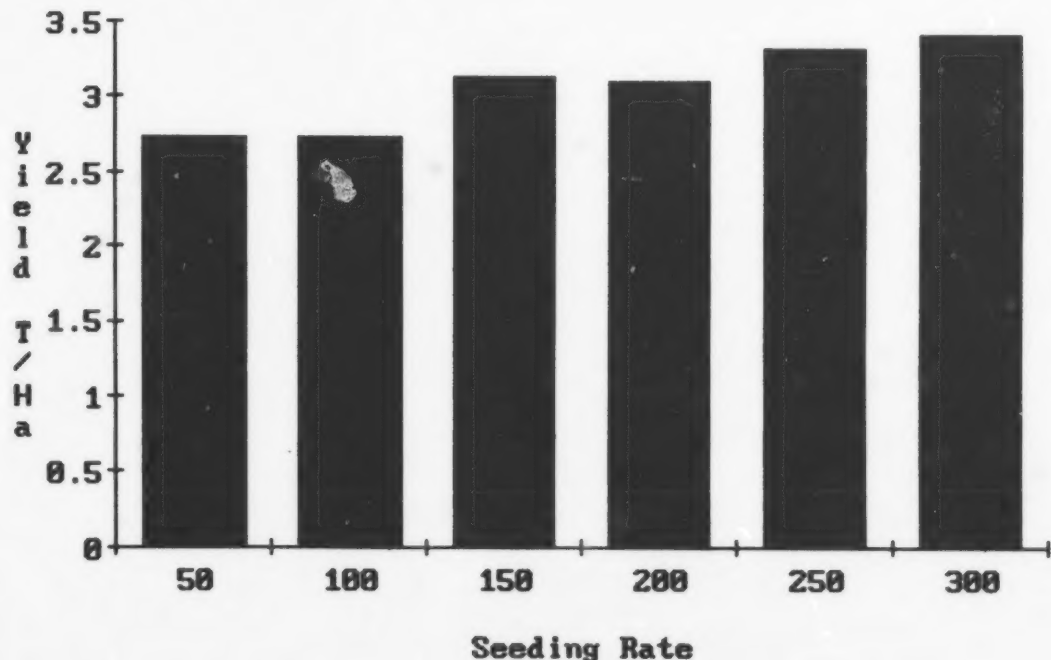


**Figure 1: EFFECTS OF SEEDING RATE ON
YIELD OF MAX WHEAT 1988**

TABLE 1: YIELD AND AGRONOMIC DATA OF MAX WHEAT SEEDING RATE STUDY, HARTLAND, N.B. 1988

Seeding Rate	Yield T/ha	Lodging Ratings*	TKW Grams	Heads /m ²	Plants /m ²	Heads /Plant	Kernels /Head	Kernels /m ²
50	2.7	.7	31.8	297	70	4.2	38	11,286
100	2.8	.7	32.9	330	127	2.6	36	11,880
150	3.2	.7	33.1	332	148	2.2	34	11,288
200	3.1	.9	32.8	352	226	1.6	35	12,320
250	3.3	.5	32.6	410	269	1.5	35	14,350
300	3.4	.8	33.0	413	290	1.4	32	13,332
LSD (.05)	.7	.5	1.5	78.7	47.3		3.5	
CV (%)	15.07	49.65	2.99	14.69	16.69		6.06	

*Belgium Lodging Scale: .2 = erect; 9.0 = totally lodged

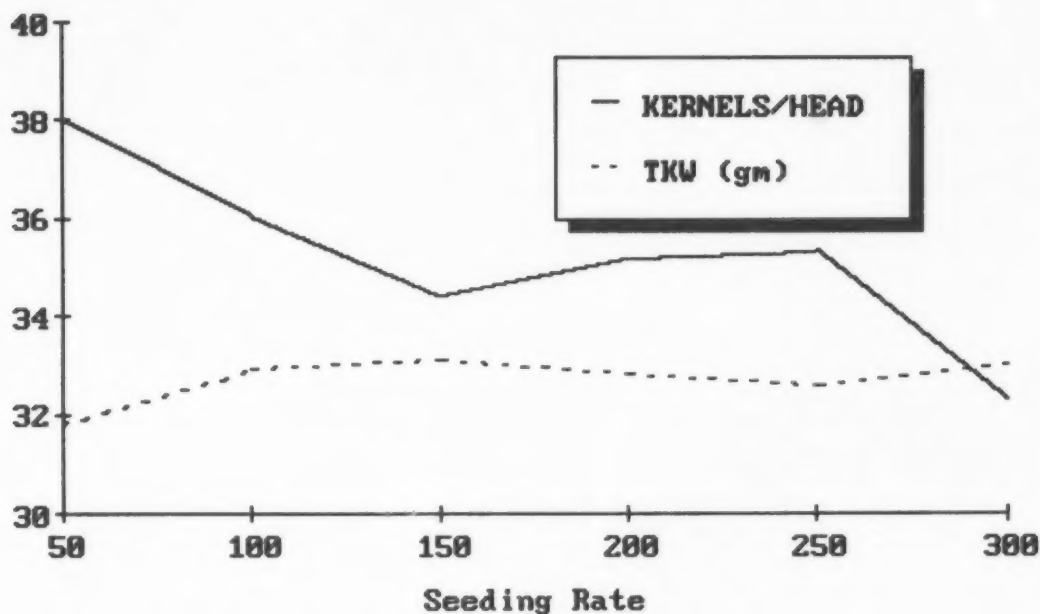


Figure 2: EFFECTS OF SEEDING RATE ON
KERNEL NUMBER PER HEAD AND
THOUSAND KERNEL WEIGHT OF MAX
WHEAT 1988

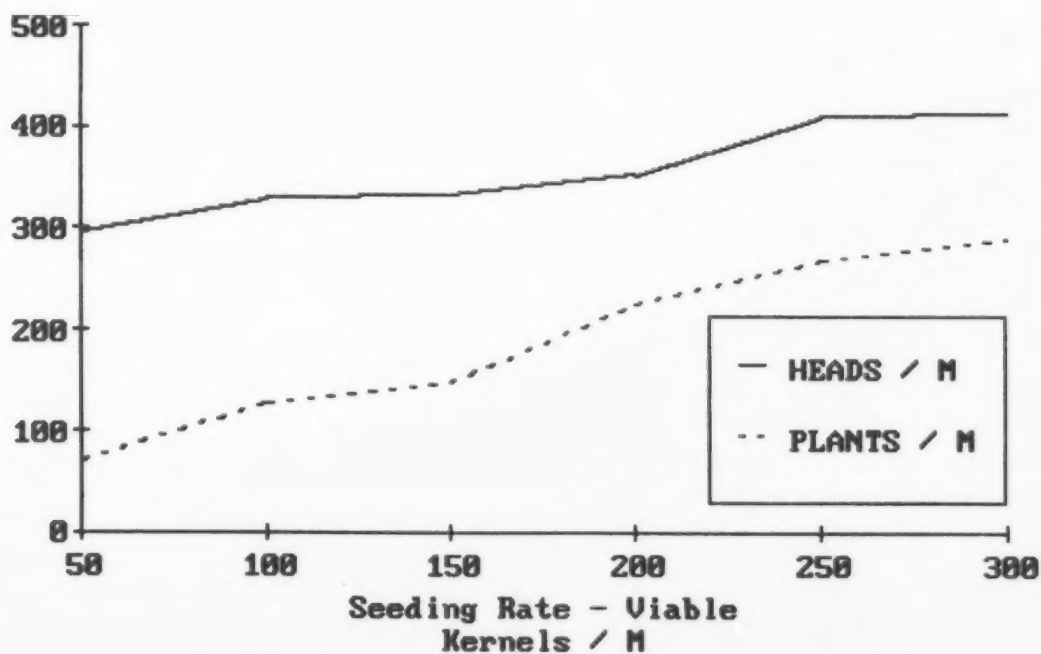


Figure 3: EFFECTS OF SEEDING RATE ON
HEAD AND PLANT COUNTS OF MAX
WHEAT 1988

CHAPAIS BARLEY SEEDING RATE STUDY

D.F. Walker and A.O.M. Smith

ABSTRACT: The barley cultivar, Chapais, was seeded at Hartland, N.B. on May 10. Seeding rates of 50-300 viable kernels per meter sq., in increment of 50, were seeded in the R.C.B. design with 4 replications. Plots were harvested on August 19 with a small plot combine.

Increasing seeding rates from 50-300 viable kernels/m² significantly increased yield, plant population, and head population. Kernels/head were not significantly effected by seeding rate, but there was a trend to reduced kernels/head as the seeding rate increased. Lodging and thousand kernel weights were unaffected by seeding rate.

ÉTUDE DE DIVERS TAUX D'ENSEMENCEMENT DE L'ORGE CHAPAIS

Résumé: Le cultivar d'orge Chapais a été semé à Hartland (N.-B.) le 10 mai dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. Le taux d'ensemencement variait de 50 à 300 grains viables par mètre carré, et la différence entre chaque taux était de 50 grains par mètre carré. La récolte a été faite le 19 août avec une petite moissonneuse.

L'accroissement du taux d'ensemencement de 50 à 300 grains viables au mètre carré augmente de façon significative le rendement, le nombre de plants et le nombre d'épis. Le nombre de grains par épi n'a également pas varié de façon significative en fonction du taux d'ensemencement, mais il avait tendance à diminuer à mesure que le taux d'ensemencement augmentait. La résistance à la verse et le poids de mille grains n'ont pas varié aux différents taux d'ensemencement.

INTRODUCTION: Barley is continuing to gain popularity in N.B. as producers recognize the potential of new high performance cultivars. In 1988, for the first time in the history of the province, total acreages of barley approached that of oats. The increasing popularity of barley is due to Leger which until recently has outperformed all contemporary barleys.

The latest introduction, Chapais, has both superior yield and lodging resistance to Leger. Chapais will eventually replace Leger as seed supplies become available.

A seeding rate study was undertaken to determine the optimum seeding rate of Chapais. This study is a continuation of work initiated in 1986 for the purpose of determining and quantifying the effects of seeding rate upon yield and yield components.

MATERIALS AND METHODS: The barley cultivar Chapais was seeded in the RCB design with 4 reps. at seeding rates ranging from 50-300 viable kernels/m² (vk/m²) on May 10. A plot seeder with 12 cm row spacing was used to seed the 2 x 8.5 m plots. On May 9, 300 kg/ha of 15-15-15 was broadcast and incorporated. Nitrogen in the form of Ammonium Nitrate was applied at 60 kg N/ha at G.S. 31-32. Plant populations were determined at G.S. 13. Cycocel (175 g ai/ha), Tilt (125 g ai/ha) and Blagal (840 g ai/ha) were applied at G.S. 22-26 with a small plot sprayer. The Belgium Scale was used to record the lodging at harvest. A Hege 125 B plot combine was used to harvest all plots on August 11. Yield and yield components were recorded after harvest.

RESULTS AND DISCUSSION: Increasing seeding rates from 50-300

v.k/m² significantly increased yield, plant population, and head population. The major yield increase occurred when increasing seeding rates from 50 to 100 v.k/m². The yield reduction at the low seeding rate was due mainly to a significantly lower head population (Table 1). Beyond 100 v.k/m², there was no significant difference in yield; however, the 250 rate tended to be higher. This effect could possibly be explained by a higher number of kernels/head than the 200 or 300 seeding rate. All yields were high considering the growing conditions of 1988.

The seeding rate of 100 v.k/m² is equivalent to 45 kg/ha. This rate is much lower than the recommended rate of 100-110 kg/ha, indicating that there is a large range over which the barley plant can respond to variable seeding rates. Similar results have been found by Walker et al. 1987.

Lower head populations at the 50 v.k/m² rate was significantly lower than all other treatments. This is to be expected in the apparent limited ability for the cultivar to tiller. Tiller ratio was 3.5 at the low seeding rate and declined to 1.8 at the high seeding rate.

Kernels/head, TKW, and lodging were unaffected by seeding rate.

CONCLUSIONS: The recommended seeding rate of 100-110 kg/ha is approximately equal to 230 v.k/m². This is much higher than the 100 v.k/m² rate, beyond which there was no significant increase in yield. It can therefore be concluded that the recommended seeding rate of 100-110 kg/ha is adequate to achieve optimum yields under most conditions.

REFERENCES: Walker, D.F. and Duivenvoorden, C.J. 1987. Cadette Barley Seeding Date/Rate Study. Adaptive Research Reports, N.B. Department of Agriculture. 9:105-110.

ACKNOWLEDGEMENTS: The authors extend thanks to Gerald Springer for supplying plot land.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF CHAPPAIS BARLEY
SEEDING RATE STUDY, HARTLAND, N.B. 1988

Seeding Rate	Yield T/ha	T.K.W. (g)	Lodging Rating*	Plants /m ²	Heads /m ²	Kernels /Head
50	4.2B	43.0	1.4	79	276	41.5
100	4.7AB	42.2	0.3	118	383	40.0
150	4.8A	41.9	0.4	157	460	37.0
200	4.8A	41.7	0.3	210	458	33.8
250	5.2A	41.4	0.2	235	499	35.0
300	4.8A	41.7	0.2	290	513	33.5

LSD

(.05) 0.5 1.8 1.0 42.6 91.1 7.3

C.V.(%) 6.85 2.92 138.56 15.57 14.03 13.13

*Belgium Lodging Scale 0.2= erect, 9.0 = totally lodged

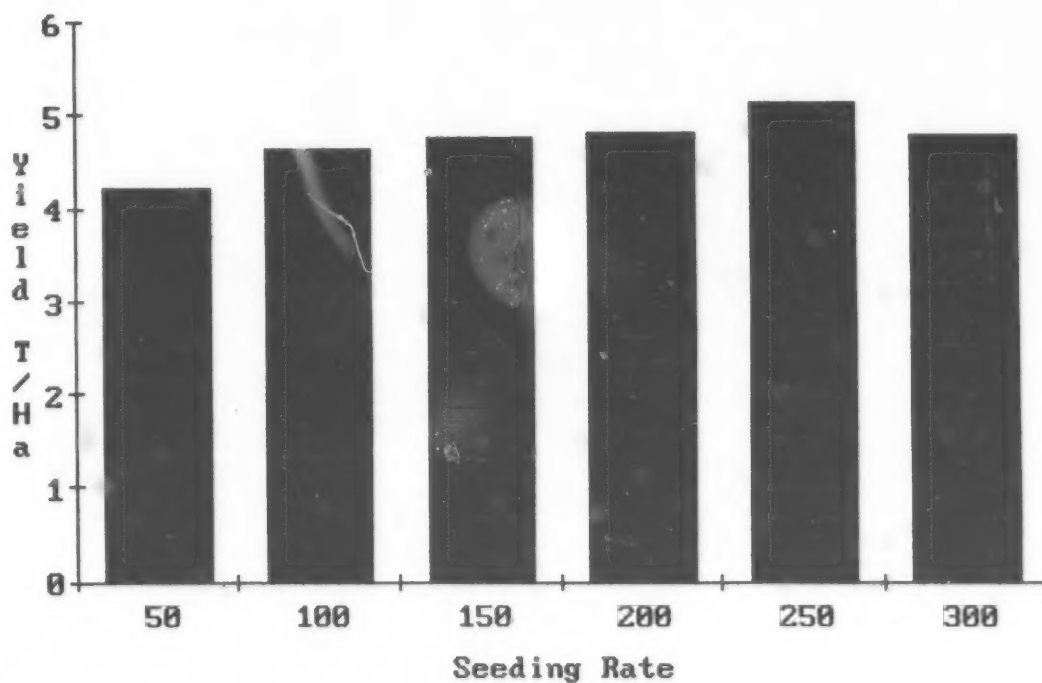


Figure 1: EFFECTS OF SEEDING RATE ON
YIELD OF CHAPPAIS BARLEY 1988

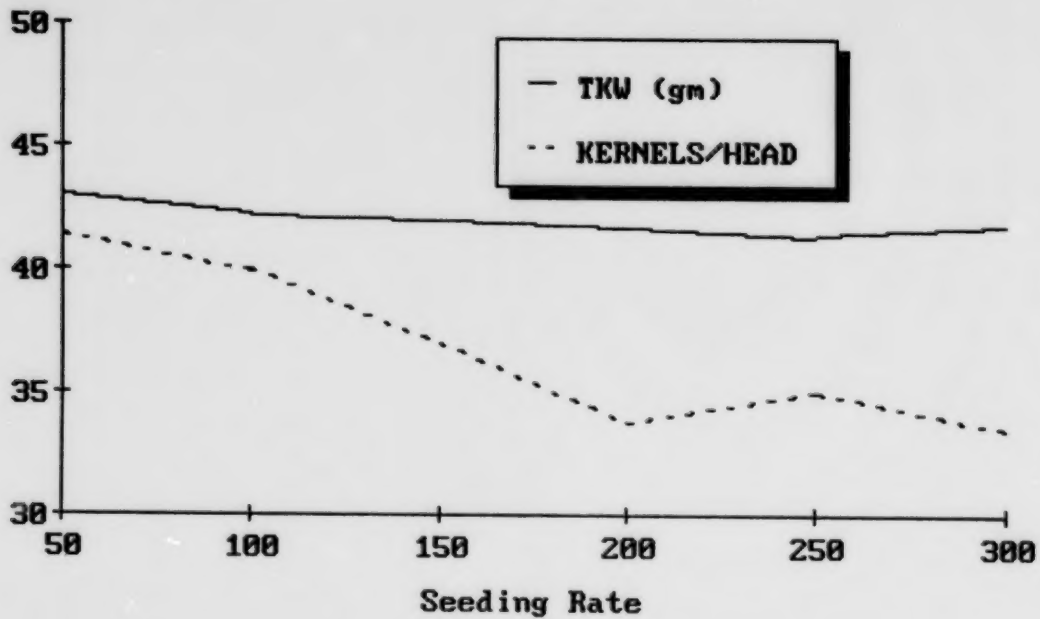


**Figure 2: EFFECTS OF SEEDING RATE ON
THOUSAND KERNEL WEIGHT AND
KERNEL NUMBER PER HEAD OF
CHAPAIS BARLEY 1988**

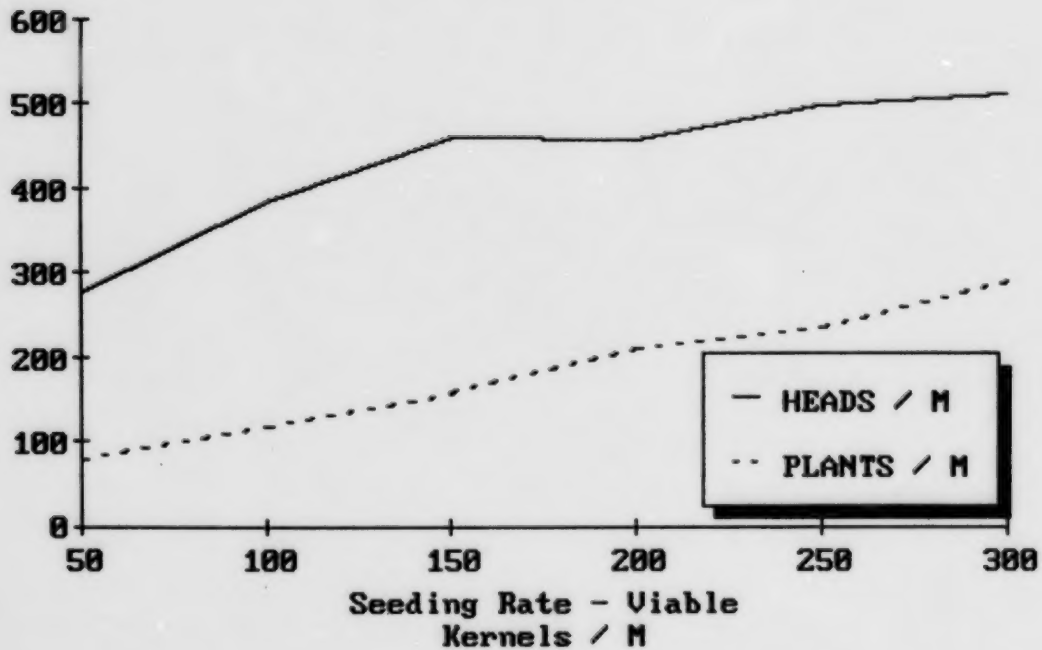


**Figure 3: EFFECTS OF SEEDING RATE ON
HEAD AND PLANT NUMBER OF
CHAPAIS BARLEY 1988**

BORDEN WINTER WHEAT SEED TREATMENT STUDY

D.F. Walker and A.O.M. Smith

ABSTRACT: Borden Winter wheat was seeded at Woodstock on Sept. 12, 1987 at a seeding rate of 300 vk/m². Five seed treatments; Vitaflo 280 (3.3 ml/kg), TF 3572 (4 ml/kg), Baytan (0.5 ml/kg), TF3572 (2 ml/kg), and a check were evaluated for yield response, TKW and kernel number per head, winter survival and lodging.

The greatest yield response was from Vitaflo 280 at 5.69 T/ha, significantly higher than the check at 5.1 T/ha and the low rate of TF 3572 at 5.28 T/ha. Winter survival, lodging and kernel number per head was unaffected by seed treatment.

ÉTUDE DU TRAITEMENT DES SEMENCES DE BLÉ D'HIVER BORDEN

Résumé: Le blé d'hiver Borden a été semé à Woodstock le 12 septembre 1987 à raison de 300 grains viables au mètre carré. Cinq traitements ont été appliqués aux semences : Vitaflo 280 (3,3 ml/kg), TF 3572 (4 ml/kg), Baytan (0,5 ml/kg), TF3572 (2 ml/kg) et une parcelle n'a pas été traitée ; on a évalué l'effet sur le rendement, le poids de mille grains, le nombre de grains par épi et la résistance à l'hiver et à la verse.

Les semences traitées avec le Vitaflo 280 ont donné le meilleur rendement (5,69 t/ha), et il était bien plus grand que celui obtenu avec le blé non traité (5,1 t/ha) et que celui traité avec 2ml/ha de TF 3572 (5,28 t/ha). Le traitement des semences n'a aucunement modifié la résistance à l'hiver, la verse et le nombre de grains par épi.

INTRODUCTION: Seed treatments are the most environmentally sound, cost effective, and the easiest method of fungicide application to cereal grains. Because the products are applied to the seed, the amount used is less than if used as a foliar fungicide. The method of application is more precise and it can be done during the non-busy times of the farm work schedule and does not require expensive field equipment.

This project was initiated to evaluate 3 seed treatments; Baytan and Vitaflo at one level, and TF 3572 at two levels.

MATERIALS AND METHODS: Borden winter wheat was seeded at Woodstock, NB. at a rate of 300 vk/m² on Sept. 12, 1987. A plot seeder with 12 cm row spacing was used to seed the 2 x 8.5 m plots. The R.C.B. design with 4 reps. was used to evaluate the five seed treatments (Table 1). Each product was applied with a small experimental seed treater. All plots received 35 kg N/ha as 34-0-0 on April 21, 1988 and another 60 kg N/ha as 45-0-0 on May 17, 1988. Cycocel (175 g ai/ha) and Buctril M (560 g ai/ha) were applied at G.S. 31. Plots were harvested on August 10, 1988 with a small plot combine.

RESULTS AND DISCUSSION: The cultivar Borden will become the most widely grown feed winter wheat because of its excellent winter hardiness, high yield, and disease resistance.

The fall growing period was cool and the experiment was planted 5 days later than desired. These conditions led to less than ideal growth at freeze up. However, winter survival conditions were excellent, therefore, plant populations were more than adequate to ensure high yields. The benign winter resulted in no observable effect on winter survival due to seed treatment (Table 1).

The highest yielding treatment was Vitaflo 280 at 5.69 T/ha, significantly higher than the check at 5.19 T/ha and the low rate of the unregistered product TF 3572 at 5.28 T/ha. There were no yield differences between Vitaflo 280 and the two unregistered products, TF 3572 (at the high rate) and Baytan, due to the low level of disease pressure during the early growing season. Although there were significant yield differences due to seed treatment, the range in yields was small (5.69-5.19 T/ha). The factors of yield, TKW and kernels/head, were not significantly effected by seed treatment. This again was due to the low level of disease pressure in the early part of the growing season (Table 1).

CONCLUSIONS: In 1987, seed treatment significantly increased yields over the check. The widely used seed treatment, Vitaflo 280, had the highest yields. This product is most effective on seedling blight and smuts. The experimental products, Baytan and TF3572, are more effective on earlier season foliar diseases such as mildew, rust, and septoria tritici. These diseases were of little consequence in 1988 and could explain the lack of a large yield response.

These products should be further evaluated to determine their effectiveness in increasing yield.

ACKNOWLEDGEMENTS: The authors would like to thank Gerald Springer for providing plot land.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF BORDEN WINTER WHEAT SEED TREATMENT STUDY, WOODSTOCK, N.B. 1987-88

Seed Treatment	Rate (ml/kg)	Yield (T/ha)	TKW (g)	Kernels /head	Lodging at Harvest*	Winter Survival (%)
Vitaflo 280	3.3	5.69	40.42	31.75	0.2	100
TF 3572	4.0	5.59	40.6	34.93	0.2	100
Baytan	0.5	5.39	39.5	32.68	0.2	100
TF3572	2.0	5.28	40.09	33.95	0.2	100
Check	-	5.19	39.2	31.9	0.2	100
L.S.D. (.05)		0.38	2.67	3.35		
C.V. (%)		4.59	4.33	6.58		

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged

MILLING WHEAT SEED TREATMENT STUDY

D.F. Walker and A.O.M. Smith

ABSTRACT: Max and Katepwa wheat was treated with 3 seed treatment products: Baytan, Vitaflo 280, and Bay HWG 1608 and seeded on May 10 at Hartland, N.B. The fungicide Tilt, growth regulator Cycocel, and the herbicide Blagal were applied in a tank mixture on June 8 at G.S. 22-23.

Seed treatment had no significant effect on lodging, T.K.W., and kernels per head of Max and Katepwa. The check treatment had a significantly higher percentage of smutted heads in Max, there was no significant effect on Katepwa. The Baytan treatment on Katepwa wheat had a significantly higher yield than the Vitaflo 280. There was no significant difference in yield between treatments of Max.

ÉTUDE SUR LE TRAITEMENT DE SEMENCES DE BLÉ DE MEUNERIE

Résumé: Trois différents produits anticryptogamiques ont été utilisés pour traiter les semences de blé Max et Katepwa qui ont été mises en terre le 10 mai à Hartland (N.-B.) : il s'agissait du Baytan, du Vitaflo 280 et du Bay HWG 1608. Le 8 juin, le fongicide Tilt, le régulateur de croissance Cycocel et l'herbicide Blagal ont été mélangés dans un réservoir et appliqués sur les parcelles aux stades de croissance 22 et 23.

Le traitement des semences n'a pas eu d'effet significatif sur la verse, sur le poids de mille grains et sur le nombre de grains par épi de blé Max et Katepwa. Les semences non traitées avaient un taux plus élevé d'épis charbonnés dans le blé Max, mais le blé Katepwa n'avait pas été touché. Les semences de blé Katepwa traitées au Baytan ont donné un bien meilleur rendement que les semences traitées au Vitaflo 280. Les différents traitements du blé Max n'ont pas produit de grands écarts de rendement.

INTRODUCTION: Seed treatments are the most environmentally sound, cost effective, and the easiest method of fungicide application to cereal grains. Because the products are applied to the seed, the amount used is less than if used as a foliar fungicide. The method of application is more precise and can be done during the non-busy times of the farm work schedule and does not require expensive field equipment.

This project was initiated to evaluate 3 seed treatments; Baytan and Vitaflo 280 at one level and Bay HWG 1608 at 3 levels.

MATERIALS AND METHODS: Max and Katepwa wheat seed was treated with 3 different seed treatment products: Vitaflo 280 at 3.3 ml/kg (Carbathlin 14.9%, Thiram 13.2%), Baytan at 0.5 ml/kg (Triadinenol 317 g/l), and Bay HWG 1608 at rates of 0.4, 0.8 and 1.2 ml/kg (a - [2/4-Chlorophenyl] ethyl] - a (1,1-dimethylethyl) - 1H - 2,4-triazole -1-ethanal 143.8 g ai/l). These treatments were compared against a check treatment. Each product was applied with a small experimental seed treater. The treated Max and Katepwa seed was planted at Hartland, N.B. on May 10 at a seeding rate of 200 vk/m² in two

independent studies in the RCB design with 4 reps. Prior to seeding, 300 kg N/ha as 15-15-15 was broadcast and incorporated and another 60 kg N/ha as 34-0-0 was broadcast at G.S. 33-34. Tilt (125 g ai/ha), Cycocel (175 g ai/ha) and Blagal (840 g ai/ha) were applied at G.S. 22-23. Plots were harvested on August 19 with a small plot combine.

RESULTS AND DISCUSSION: Yields of all treatments were low compared to 1987. (Duivenvoorden and Walker 1987) and (Walker and Duivenvoorden 1987).

The low yields were due to dry weather during the first 5 weeks of the growing season. This resulted in the 3 factors of yield: head population, T.K.W. and kernels/head being reduced.

The Baytan treatments significantly increased the yield of Katepwa compared to the Vitoflo 280 treatment. All other treatments were not significantly different than Vitaflo 280 (Table 1). All other parameters of Katepwa wheat including lodging, T.K.W., kernels/head and smut ratings were unaffected by seed treatments.

In Max, the check treatment had a significantly higher percentage of smutted heads than all other treatments (Table 2). All other parameters including: yield, lodging, T.K.W. and kernels/head were unaffected by seed treatment.

In comparing Max and Katepwa yields, T.K.W. and lodging were similar. The number of kernels/head for Katepwa was much lower than Max; therefore, the number of heads/m² for Katepwa had to be greater to achieve close to similar yields.

CONCLUSIONS: The moisture deficit in the first 5 weeks of the growing season had a large impact on the final yield potential of the 2 cultivars. Because of this, much of the response to seed treatment was masked. This study confirmed that all seed treatments control smut. Baytan did significantly increase yields over Vitaflo 280.

This experiment should be repeated in 1989.

REFERENCES: Duivenvoorden, C.J. and Walker, D.F. 1987. Max Wheat PGR Study. Adaptive Research Reports, N.B. Department of Agriculture. 9:53-56.

Walker, D.F. and Duivenvoorden, C.J. 1987. Max Wheat Fertility Study. Adaptive Research Reports. N.B. Department of Agriculture. 9:57-60.

ACKNOWLEDGEMENTS: The authors wish to thank Gerald Springer for providing plot land for this study.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF KATEPWA MILLING WHEAT AS EFFECTED BY SEED TREATMENT

Seed Treatment	Rate (ml/kg)	Yield (t/ha)	Lodging at Harvest*	TKW (g)	Kernels /head	Smut Rating (% Heads)
Check	-	2.24 AB	2.9	31.06	21.25	0
Baytan	0.5	2.54 A	2.9	21.68	20.70	0
Bay HMG 1608	0.4	2.27 AB	2.9	31.68	19.85	0
Bay HMG 1608	0.8	2.33 AB	2.9	31.19	19.67	0
Bay HMG 1608	1.2	2.31 AB	2.9	31.51	21.68	0
Viteflo 280	3.3	2.2 B	2.6	30.73	21.13	0
L.S.D. (.05)		.32	.41	1.81	2.32	
C.V. (%)		9.07	9.33	3.83	7.45	

* Belgium Lodging Scale - 0.2 = erect, 9.0 = totally lodged

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF MAX MILLING WHEAT AS EFFECTED BY SEED TREATMENT

Seed Treatment	Rate (ml/kg)	Yield (t/ha)	Lodging at Harvest*	TKW (g)	Kernels /head	Smut Rating (% heads)
Check	-	2.46 A	2.15	28.75	32.45	5.5
Baytan	0.5	2.58 A	2.0	29.53	30.8	0
Bay HMG 1608	0.4	2.57 A	2.75	28.95	33.18	0
Bay HMG 1608	0.8	2.59 A	2.45	29.47	32.38	0
Bay HMG 1608	1.2	2.65 A	2.7	29.35	33.8	0
Viteflo 280	3.3	2.69 A	2.5	29.64	31.28	0
L.S.D. (.05)		0.35	1.59	2.19	4.11	
C.V. (%)		9.02	43.42	4.96	8.43	

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged

MAX MILLING WHEAT NITROGEN FERTILITY TRIAL

D.F. Walker and A.O.M. Smith

ABSTRACT: Max wheat was seeded on May 10 at a rate of 200 v.k./m². Five levels of nitrogen fertility; 30, 60, 90, 120, 150 kg N/Ha from two sources, Ammonium Nitrate and Urea, were compared in a R.C.B. design with a split over Nitrogen source.

Increasing the nitrogen application had no effect on yield. Collectively, the Urea treatments gave a significantly higher yield. Lodging was unaffected by level or source; however, there was a level/source interaction. TKW was unaffected by nitrogen level but Urea had a significantly higher TKW. Both source and level significantly effected the percent protein in the kernels.

ESSAI D'ENGRAIS AZOTÉS SUR LE BLÉ DE MEUNERIE MAX

Résumé: Le blé Max a été semé le 10 mai à raison de 200 grains viables par mètre carré. Cinq différents taux d'application d'azote (30, 60, 90, 120 et 150 kg/ha) provenant de deux sources d'azote (nitrate d'ammonium et urée) ont été comparés dans un dispositif expérimental en blocs divisés au hasard et répété quatre fois. Les deux sources d'azote ont été appliquées.

L'augmentation des applications d'azote n'a pas eu d'effet sur le rendement. En général, les traitements à l'urée ont donné un rendement beaucoup plus élevé. Les taux d'application et la source d'azote n'ont pas eu d'effet sur la verse; toutefois, on a constaté une interaction entre le taux d'application et la source. Le poids de mille grains n'était pas touché par le taux d'application d'azote, mais celui du blé traité à l'urée était beaucoup plus élevé. Le taux d'application et la source d'azote ont une incidence significative sur le taux de protéine dans les grains.

INTRODUCTION: Milling wheat production involves a considerable producer investment. The price is \$80-100 more per tonne than that of feed wheat, but the cost of added inputs for crop nutrition and protection are significant and the results are not guaranteed. Disease control is required to prevent downgrading due to kernel size and color, and fertility applications are necessary to ensure the attainment of acceptable grain protein levels. While fungicidal costs are predetermined from a producer point of view, both the source and level of nitrogen (N) fertility applied can affect the production cost of the crop. Urea is normally less expensive than Ammonium Nitrate and is more concentrated, reducing handling costs. It is of benefit to the producer to know how fertility costs may be reduced without jeopardizing kernel quality.

This study was undertaken to determine the effects of N source upon yields and quality characteristics of Max wheat and to determine N levels at which the attainment of milling grade may be assured.

MATERIALS AND METHODS: Max wheat was seeded at Hartland, N.B. on May 10. The seeding rate was 200 v.k./m² with a 12 cm row spacing. Two sources of N, Ammonium Nitrate (A.N) and Urea, were split over application rates of 30, 60, 90, 120 and 150 kg N/Ha in the RCB design with 4

reps. (Table 1). The 30 kg N/Ha treatment was applied as a single application on May 19 at G.S. 04-08. Half of the 60, 90, 120, 150 N/Ha treatment was also applied at G.S. 04-08. The other half of the treatment was applied on June 14 at G.S. 31. All plots received a tank mixture of Tilt (125 g ai/Ha), Cycocel (175 g ai/Ha) and Blagal (840 g ai/Ha) at G.S. 22-23. Lodging ratings were recorded at harvest using the Belgium Lodging Scale. All plots were harvested on August 19 with a small plot combine.

RESULTS AND DISCUSSION: Increasing N levels from 30-150 Kg N/Ha had no effect on yield for either N source. The lack of response could have been due to a large carry over of N from the previous potato crop, weather, and disease conditions during the growing season. The summer and fall of 1987 (previous year) were very dry and could have resulted in high levels of residual N. Weather conditions in the early part of the 1988 growing season were dry, discouraging tillering which resulted in a low head population at harvest (Table 1). Excess moisture during the later half of the growing season resulted in high disease pressure. The low head population and high disease pressures resulted in low yields (Table 1) compared to 1987 (Walker and Duivenvoorden, 1987). High levels of residual N and low yields caused a lack of response to increasing N levels. Collectively, the Urea treatments yield 0.33 T/Ha more than A.N. This could be due to a significantly reduced lodging rating for the Urea treatments.

The A.N. treatments lodged significantly more than the Urea treatments. This could be due to a higher level of N availability at an earlier more vulnerable stage of growth.

Both N source and level significantly effected the grain % protein. In 1987, Walker and Duivenvoorden found that with each additional increment of N, there was an increase in grain % protein. In 1988, the % protein was significantly effected by N level; however, there was no consistency in the response from either N level or source (Table 1). Percent protein levels were significantly higher from the Urea source. This could have occurred as a result of the N from the Urea becoming available later in the growing season. Percent protein at all levels and both sources was very high (mean of all treatments = 20.9%) confirming that residual soil levels were excessive.

TKW, plant population, and kernels/head were not significantly effected by N level or source.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF MAX MILLING WHEAT NITROGEN FERTILITY TRIAL, 1988

Fertility Source	Fertility Level Kg N/Ha	Yield (T/Ha)	Kernel % Protein	Lodging at Harvest*	TKW (g)	Heads /m ²	Kernels /head	Kernels /m ²
A.N.	30	2.64	18.0	0.2	35.53	357	28.95	10355.6
A.N.	60	2.91	18.69	1.65	33.88	360	30.8	11006.9
A.N.	90	2.65	18.11	1.3	33.09	321.5	28.03	8951.75
A.N.	120	3.05	19.49	0.35	34.46	324	29.23	9449.35
A.N.	150	2.69	18.4	1.25	33.84	313	27.93	8736.35
Mean		2.79	18.54	0.95	34.16	335.1	28.99	9699.99
Urea	30	3.22	19.67	0.35	34.91	353	29.78	10511.3
Urea	60	2.9	18.86	0.45	32.49	325.5	29.68	9660.45
Urea	90	3.0	20.41	0.75	35.04	364	30.18	10952.2
Urea	120	2.94	18.86	0.75	32.6	321.5	30.75	9961.1
Urea	150	2.97	19.9	0.2	34.77	318	30.55	9589.7
Mean		2.98	23.25	0.5	33.96	336.4	30.19	10134.97
LSD (.05)		0.33		1.18	1.83	68.7	2.4	2471.84
C.V. (%)		7.59		108.05	3.56	13.57	5.37	16.54

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF KATEPWA MILLING WHEAT NITROGEN FERTILITY TRIAL, 1988

Fertility Source	Fertility Level Kg N/Ha	Yield (T/Ha)	Kernel % Protein	Lodging at Harvest*	TKW (g)	Heads /m ²	Kernels /head	Kernels /m ²
A.N.	30	2.44	19.44	1.0	33.61	412	21.93	9041.35
A.N.	60	2.47	20.13	0.8	34.41	352	21.28	7505.85
A.N.	90	2.37	19.55	1.4	33.66	394	21.2	8304.35
A.N.	120	2.42	20.13	1.05	33.0	424	22.88	9716.7
A.N.	150	2.32	19.15	1.55	32.99	413	22.18	9149.5
Mean		2.4	19.68	1.16	33.53	399	21.89	8743.55
Urea	30	2.56	20.13	1.4	32.4	387	21.13	8168.35
Urea	60	2.5	19.26	1.55	33.0	441.5	22.15	9818.9
Urea	90	2.6	20.01	1.25	31.87	435	20.25	8791.8
Urea	120	2.4	19.15	1.05	32.91	395	21.53	8521.75
Urea	150	2.6	20.13	1.05	33.03	462.5	21.98	10172.1
Mean		2.53	19.74	1.26	32.64	424.2	21.41	9094.18
LSD (.05)		0.28		1.39	1.6	55.33	1.88	1418.77
C.V. (%)		7.47		76.37	3.22	8.92	5.75	10.55

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged

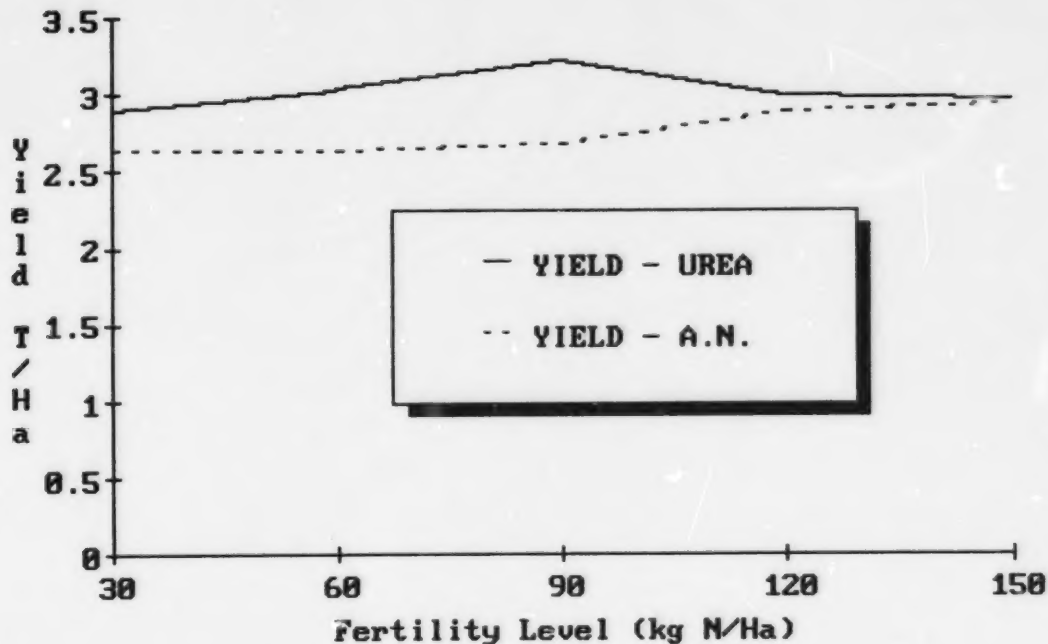


Figure 1: EFFECTS OF FERTILITY LEVEL AND SOURCE ON YIELD OF MAX MILLING WHEAT 1988

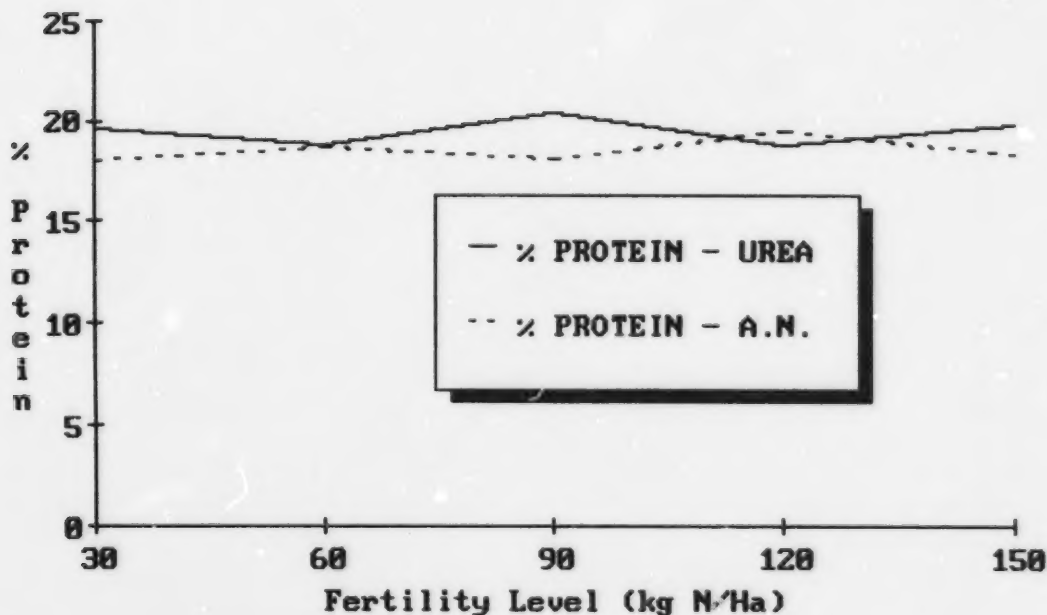


Figure 2: EFFECTS OF FERTILITY LEVEL AND SOURCE ON PERCENT PROTEIN OF MAX MILLING WHEAT 1988

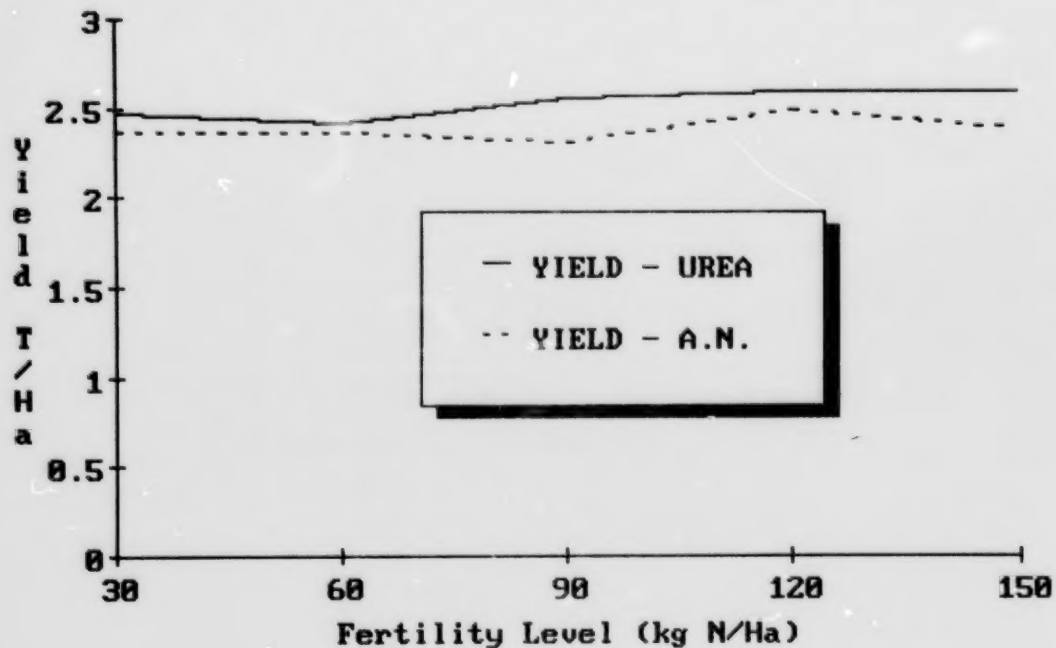


**Figure 3: EFFECTS OF FERTILITY LEVEL
AND SOURCE ON YIELD OF
KATEPWA MILLING WHEAT 1988**

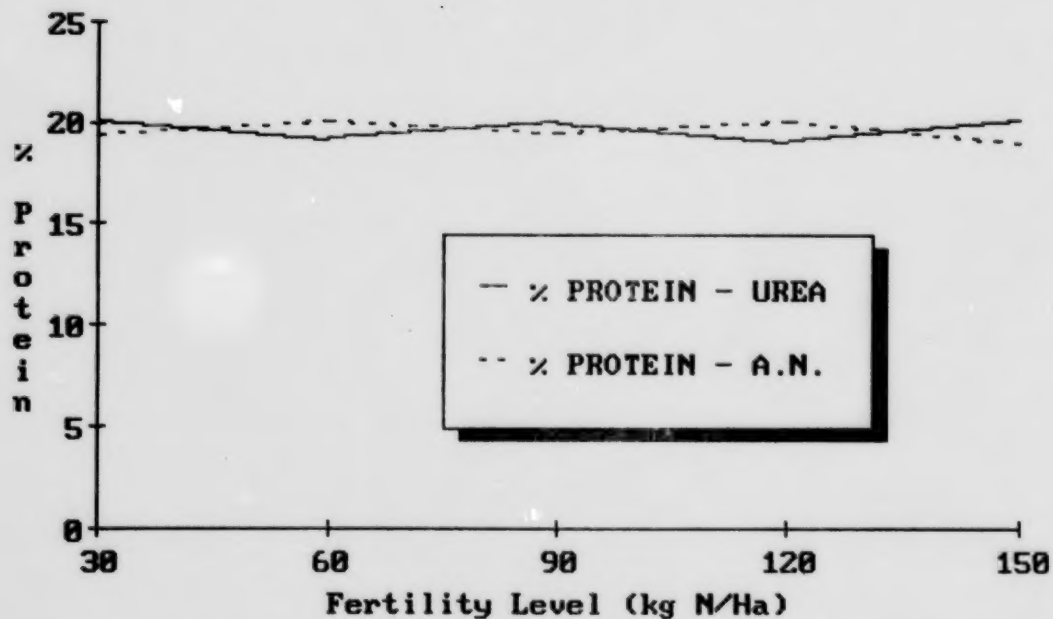


**Figure 4: EFFECTS OF FERTILITY LEVEL
AND SOURCE ON PERCENT
PROTEIN OF KATEPWA MILLING
WHEAT 1988**

CONCLUSIONS: In 1988, residual N levels were high. Therefore, the response from increasing N applications and source were masked. The effects from weather and disease conditions also helped to reduce any response from N treatment. However, when all parameters are considered, Urea gave a slight advantage. Percent protein in all treatments were well above the minimum of 13.5% which is considered the standard for No. 1 milling wheat.

Future studies should be undertaken on sites that are low in residual N levels and N tests taken to quantify available amounts.

A similar N fertility trial was conducted on Katepwa wheat. As with the Max trial, the effects of N level and source were masked due to high levels of residual N and low yields caused by weather and disease (Table 2).

REFERENCES: Walker, D.F. and Duivenvoorden, C.J. 1987. Max Wheat Fertility Study, Adaptive Research Reports, N.B. Department of Agriculture. 9:57-60.

ACKNOWLEDGEMENTS: The authors would like to thank Gerald Springer for providing plot land.

HARRINGTON MALTING BARLEY FERTILITY TRIAL

D.F. Walker and A.O.M. Smith

ABSTRACT: Harrington barley was seeded at 200 v.k./m² on May 10 at Hartland, N.B. Ammonium Nitrate and Urea were broadcast at 0, 30, 60, and 90 kg N/ha. Plots were harvested on Aug. 11.

Neither nitrogen source or level had any effect on yield, lodging, TKW, and kernel/head; however, the Ammonium Nitrate levels tended to have higher yields. Lodging at harvest was significantly effected by nitrogen source and level.

ESSAI D'ENGRAIS AZOTÉ SUR L'ORGE DE MALTAGE HARRINGTON

Résumé: L'orge Harrington a été semé le 10 mai à raison de 200 grains viables par mètre carré à Hartland (N.-B.). Du nitrate d'ammonium et de l'urée ont été épandus à la volée aux taux de 0, 30, 60 et 90 kg/ha. La récolte a eu lieu le 11 août.

La source d'azote et le taux d'application n'ont pas eu d'effet sur le rendement, la verse, le poids de mille grains et le nombre de grains par épi; toutefois, le nitrate d'ammonium semblait procurer de meilleurs rendements. La source d'azote et le taux d'application ont eu une influence significative sur la verse au moment de la récolte.

INTRODUCTION: Although feed grain prices have rebounded as a result of the Western drought in 1988, they are still at or close to the cost of production. N.B. grain farmers should strive to produce higher value grain crops. The N.B. Department of Agriculture is devoting some of its technology development expertise to researching the potential of these crops. The most promising higher value crops are milling wheat and malting barley. Unlike milling wheat, malting barley has never been produced in the province. However, the 1987 Cultivar Evaluation Trials indicate that malting barley production is possible. One small N.B. brewery and Canada Malting of Winnipeg have indicated that they are willing to work with growers in N.B. to produce malting barley. One of the main considerations in producing barley for the brewing industry is for the grain to have low protein. The greatest influence on grain protein is nitrogen, either residual nitrogen from the previous crop or from fertilizer nitrogen application during the production year.

This study was initiated to determine the effects of fertilizer nitrogen applications on the grain percent protein of Harrington barley. A second objective of this study was to determine the optimum nitrogen fertility level to achieve both desired grain protein levels (11-11.5%) and optimum yields.

MATERIALS AND METHODS: Harrington barley was seeded with a plot seeder at a rate of 200 v.k./m². The plots were seeded on May 10 at Hartland, N.B. The RCB design with 4 reps. was used to evaluate two sources of fertility,

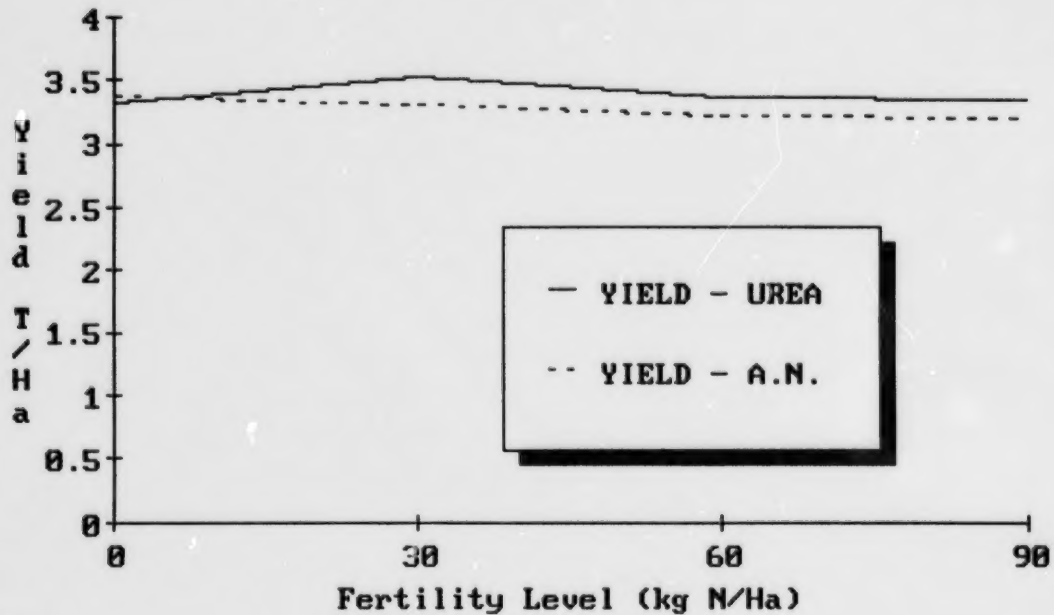


Figure 1: EFFECTS OF FERTILITY LEVEL AND SOURCE ON YIELD OF HARRINGTON MALTING BARLEY 1988

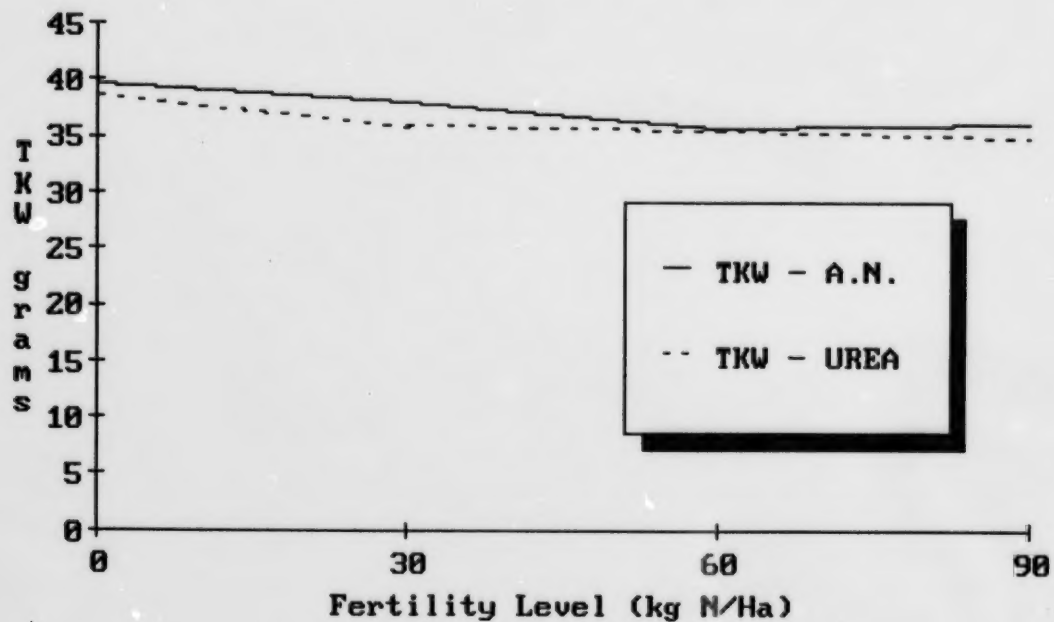


Figure 2: EFFECTS OF FERTILITY LEVEL AND SOURCE ON THOUSAND KERNEL WEIGHT OF HARRINGTON MALTING BARLEY 1988

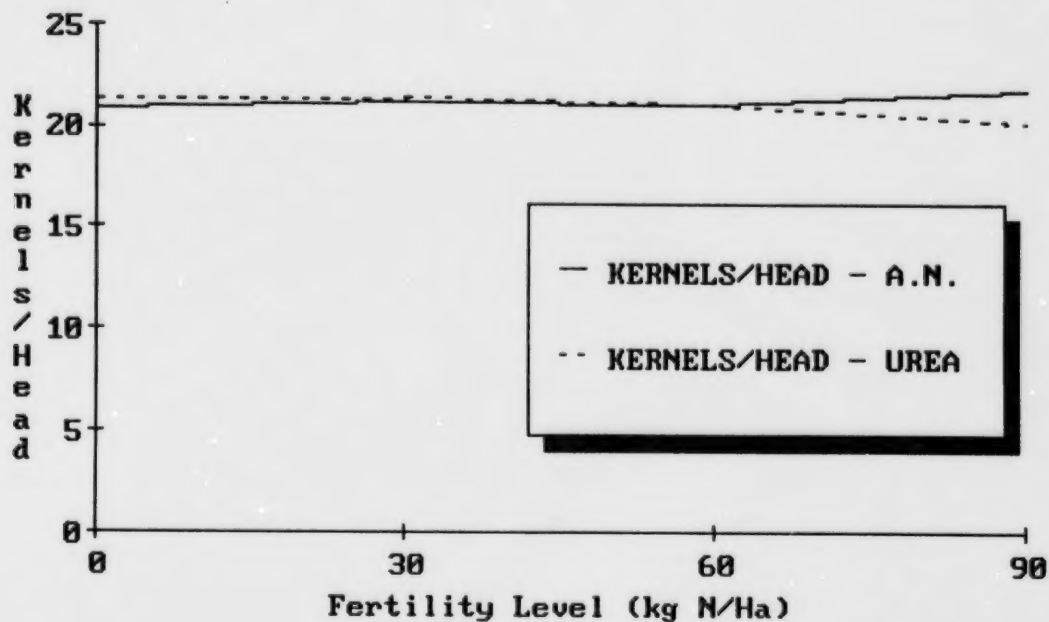


Figure 3: EFFECTS OF FERTILITY LEVEL
AND SOURCE ON KERNEL NUMBER
PER HEAD OF HARRINGTON
MALTING BARLEY 1988

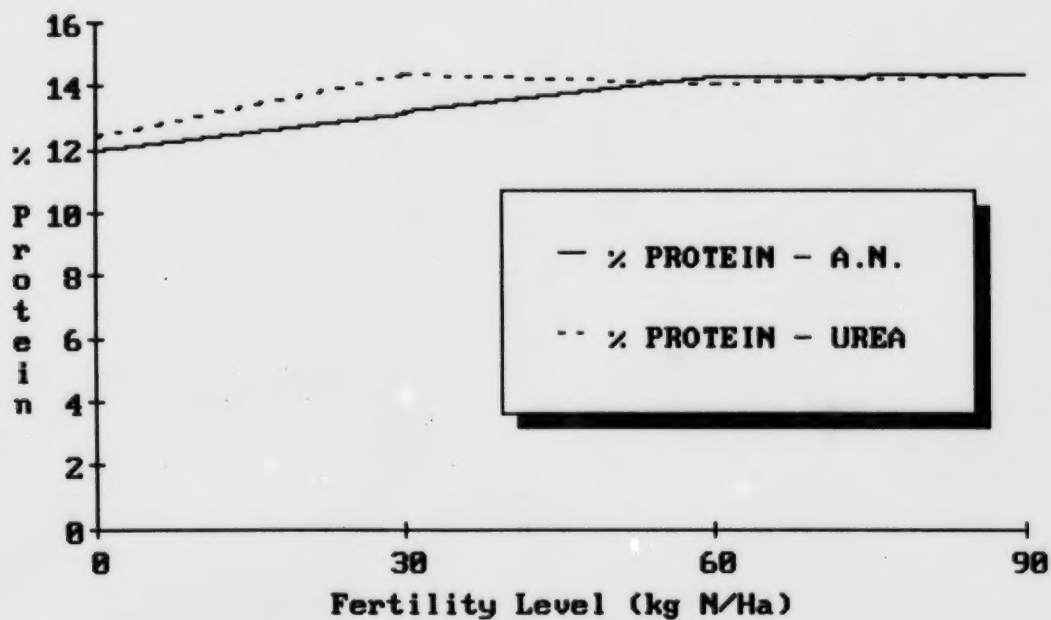


Figure 4: EFFECTS OF FERTILITY LEVEL
AND SOURCE ON PERCENT
PROTEIN OF HARRINGTON
MALTING BARLEY 1988

Ammonium Nitrate and Urea, at 0, 30, 60 and 90 kg N/ha. Treatments were applied as a single application on May 19 at G.S. 09. On June 8, a tank mixture of Cycocel (175 g ai/ha), Tilt (125 g ai/ha) and Blagal (840 g ai/ha) was applied at G.S. 22-26. The Belgium Scale was used to record lodging prior to harvest. The trial was harvested on August 11 with a small plot combine.

RESULTS AND DISCUSSION: Neither nitrogen source or level had any effect upon yield, lodging, T.K.W. and kernels/head, however, the Ammonium Nitrate treatments tended to have higher yields. The lack of response to nitrogen source or level could be due to very high quantities of residual nitrogen in the soil from the previous potato crop. Precipitation amounts during the previous growing season and fall-winter period were low. These factors could have enhanced residual nitrogen levels. The 1988 growing season was characterized by low precipitation in the early spring and high levels toward the end of the growing season encouraging lodging, disease and poor kernel color. Heat unit accumulations were approx. 250 units above normal causing the barley to advance through its growth stages rapidly. A combination of these factors led to very low yields (Table 1) compared to 1987 (Walker et al, 1987).

Increasing the nitrogen applications increased the grain percent protein from 12.0 to 14.4 and from 12.4 to 14.4 for Ammonium Nitrate and Urea resp. as the fertility source. This agrees with the findings of many other researchers who have concluded that increasing nitrogen application levels increases the grain protein level. The 0 kg nitrogen rate had a protein level of 12% confirming that residual soil nitrogen levels were high. Even at the 0 kg level of nitrogen application, the percent protein was higher than the desired level of 11-12%.

CONCLUSION: It can be concluded that the residual nitrogen levels were high, therefore, there was little response to increasing the level of nitrogen fertility. If malting barley is to be grown, residual nitrogen levels should be determined to help gauge fertility application. Where rainfall in previous years was low, caution should be taken to keep nitrogen fertility application low. Nitrogen source appears to have little effect on yield or percent protein.

REFERENCES: Walker, D.F., Duivenvoorden, C.J. and Bamford, B.A. 1987. Malting Barley Cultivar Evaluation Trial. Adaptive Research Reports, N.B. Department of Agriculture. 9: 88-90.

ACKNOWLEDGEMENTS: The authors extend thanks to Gerald Springer for providing plot land.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF HARRINGTON MALTING BARLEY FERTILITY TRIAL, HARTLAND, N.B. 1988

Nitrogen Source	Fertility Level (kg N/ha)	Yield (T/ha)	Lodging at Harvest*	TKW (g)	Kernels /Head	Kernels % Protein
Ammonium Nitrate	0	3.32 A	2.55	39.7	20.9	12.0
Ammonium Nitrate	30	3.52 A	7.48	37.97	21.23	13.2
Ammonium Nitrate	10	3.36 A	8.95	35.75	21.15	14.3
Ammonium Nitrate	90	3.34 A	9.0	36.08	21.83	14.4
Mean		3.38	1.99	37.38	21.28	13.5
Urea	0	3.37 A	6.53	38.72	21.38	12.4
Urea	30	3.3 A	8.41	35.87	21.4	13.4
Urea	60	3.21 A	9.0	35.54	21.08	14.1
Urea	90	3.2 A	9.0	34.89	20.17	14.4
Mean		3.27	8.23	36.26	21.01	13.6
L.S.D. (05)		.33	1.93	2.31	2.14	.61
C.V. (%)		6.63	17.04	4.23	6.81	3.04

*Belgium Lodging Scale 0.2 = erect, 9.0 = totally lodged

1987 WEED SURVEY OF NEW BRUNSWICK CEREAL FIELDS

K.V. McCully and A.G. Thomas

ABSTRACT: A weed survey of 113 New Brunswick cereal fields was conducted over 88 farms to determine the most common and prevalent weeds associated with cereal production. Weed density and species composition were recorded in 20 one square meter quadrats placed randomly along transects in each field. Frequency, field uniformity, densities and relative abundances were then calculated. A total of twenty-six weed species were observed within the surveyed cereal fields. The results indicated that the most common weed species identified in New Brunswick, ranked by relative abundance included: quackgrass (33.5) hempnettle (29.0), sheep sorrel (21.6), corn spurrey (20.6), ox-eye daisy (19.2), chickweed (18.7) and tufted vetch (16.5). Other weeds which may become more widespread despite having low relative abundances included field pansy, yellow nut sedge, volunteer buckwheat, wild oats, bladder campion, and yarrow.

RÉSULTATS POUR 1987 DE L'ENQUÊTE SUR LES MAUVAISES HERBES DANS LES CHAMPS DE CÉRÉALES AU NOUVEAU-BRUNSWICK

Résumé: Une enquête sur les mauvaises herbes dans 113 champs de céréales appartenant à 88 exploitations agricoles du Nouveau-Brunswick a été effectuée pour identifier les mauvaises herbes les plus fréquemment associées aux cultures de céréales. On a enregistré la densité des mauvaises herbes et les variétés répertoriées dans vingt quadrats de un mètre carré choisis au hasard le long des sections transversales de chaque champ. On a ensuite calculé l'uniformité du champ, et la fréquence, les densités et les quantités relatives de mauvaises herbes. Un total de 26 espèces de mauvaises herbes a été relevé dans les champs de céréales examinés. Les résultats indiquent que les mauvaises herbes les plus répandues au Nouveau-Brunswick par ordre d'importance étaient les suivantes : le chiendent (33,5), le galéopside (29), le rumex petite-oreille (21,6), la spargoute (20,6), la marguerite (19,2), la stellaire moyenne (18,7) et la vesce jargeau (16,5). Les autres mauvaises herbes qui peuvent se répandre davantage malgré leur faible quantité relative sont la pensée des champs, le souchet comestible, le sarrasin spontané, la folle avoine, la silène cucubale et l'achillée millefeuille.

INTRODUCTION: In recent years, concern has been expressed over herbicide resistant weeds in cereals. Early in 1985, the directors of the New Brunswick Grain Commission requested that a survey of weeds growing in grain fields be conducted in order to verify the validity of this concern. This project was initiated as a response to this request. Data from the 1985 weed survey can be found in the 1986 Adaptive Research Reports and a discussion on weed composition and densities as related to farming practices can be found in the 1987 Adaptive Research Reports.

MATERIALS AND METHODS: Surveys were conducted on 113 fields (oats, barley and wheat) on 88 farms throughout N.B. Surveys were conducted in July and August after herbicide applications were completed. The survey technique used was that developed by Ivany and Thomas for use on Prince Edward Island farms in 1979. The surveyor started on a corner of the field, moved 50 paces along the edge of the field, made a 90° turn and then moved into the field 50 paces. The surveyor then turned 45°, moved 10 paces and laid down the first one square metre

quadrat. The densities of all weed species contained within this sampling unit were recorded. This procedure was continued until 20 quadrats had been sampled.

Data was analyzed by Agriculture Canada at Regina, Saskatchewan.

The following terms and definitions are used in this report:

frequency: indicates the percentage of the surveyed fields in which at least one specimen of a particular weed occurred. This value does not indicate how often the weed occurred in each of the fields.

occurrence fields: fields in which a particular weed occurred.

field uniformity: indicates the percentage of sampling units (20 per field), in occurrence fields, in which a particular weed occurred. For example, if clover appeared in 10 fields, there would be a total of 10×20 sampling units; if 100 of these sampling units contained clover, then field uniformity would equal

$$\frac{100}{200} \times 100\% = 50\%$$

field density: the density of a particular weed in average number of specimens per occurrence fields. Density is expressed as number per square metre.

density range: the range of weed densities for a species from all occurrence fields. For instance, if a range of 0.2 - 46.2 for clover was found, this would mean that one of the 92 fields had the minimum density of 0.2 clover plants/m² and another of the 92 fields had the maximum density of 46.2/m².

relative abundance: A numerical value that takes into account 3 parameters present in the survey:

- (1) the presence or absence of the weed in each of the 20 sampling units in a field;
- (2) the presence or absence of the weed in each of the fields;
- (3) the mean density of the weed in each of the fields. This density value is averaged over all fields in the province, regardless of whether or not the weed was present in the fields.

The values presented have no units attached to them but the value for one species in comparison to another indicates the relative abundance of the species.

Relative abundance does not necessarily relate to the competitive ability of the weed.

PROVINCIAL SUMMARY

Many weeds are well adapted to survive the management practices used in New Brunswick cereal production. Seventy-six different weed species were identified within the quadrats of the 113 fields surveyed (see Table 1).

The survey indicated that the worst weed in New Brunswick cereal fields was quackgrass. This weed was found in over half the surveyed cereal fields (53.1%), had the second highest field uniformity, had the highest average field density in all and occurrence fields and as a result had the highest relative abundance.

Other weeds found in over half the fields surveyed included hempnettle (75.2%), sheep sorrel and annual smartweed species (66.4%), ox-eye daisy and tufted vetch (55.8%), corn spurrey (54.0%), and chickweed (50.4%) (see Table 1). Frequencies of the remaining 68 weed species ranged from 0.9% to 39.8%.

The weeds with the highest frequencies also had the highest field uniformities, indicating that these weeds were escaping control. For example, hempnettle was located in a large number of fields and was uniformly distributed throughout the fields. A few other weeds escaping control were quackgrass, sheep sorrel, corn spurrey, ox-eye daisy, chickweed, tufted vetch and annual smartweed species.

The life cycle and phenology of these weeds may account for their lack of control by various herbicides as well. For example, many weeds may initially be controlled by herbicides but if a large seed bank had been established in previous years, a second and/or third flush of weeds may germinate. This would give the impression that they cannot be controlled or are resistant to the herbicide being applied.

Weeds which have low field uniformities and low frequencies are usually considered to be effectively controlled by currently used herbicides. However, these weeds could actually be developing a resistance or tolerance mechanism to the herbicides, or could be newly introduced weeds which are just becoming established. Subsequent surveys will help monitor any population shifts of these weeds.

Another useful quantitative measure in determining the fields uniformity is to analyze the data from only those fields in which the weed occurred, thereby indicating how

uniformly spread these weeds were in occurrence fields. Common groundsel was found in only 0.9% of the fields surveyed, had a relative abundance of 0.4 and a low field uniformity (all fields) 0.5%. However its field uniformity (occurrence fields) was 55% ranking it as the most uniformly distributed weed in fields where it was present. Other weeds with high uniformities (occurrence fields) but low frequencies and field uniformities (all fields) were wild oats, volunteer buckwheat, volunteer barley, yellow nut sedge, alsike clover, bladder campion, yarrow and field pansy. (Field pansy, volunteer buckwheat and yellow nut sedge should be of particular concern since they also had high densities in these fields as well). These weeds are important to monitor, since fields where they are present, they apparently can survive and spread uniformly throughout the field. These weeds may pose threats in future years.

Quackgrass was notably the most abundant weed with a density of 12.8 plants m^2 , averaged over all fields. Hempnettle was the second most abundant weed (7.0 plants m^2). Only five other weeds had densities over three plants m^2 , corn spurrey (5.7 m^2), chickweed (5.1 m^2), sheep sorrel (4.8 m^2), ox-eye daisy (3.9 m^2) and lambs-quarters (3.8 m^2).

When examining the weed density of fields in which the species occurred, the density of most species increased when compared to densities obtained from all fields. Quackgrass still had the highest density (24.0 m^2) followed by field pansy (14.8 m^2), yellow nut sedge (14.6 m^2). This indicated that field pansy and yellow nut sedge, although being found in a low number of fields, when present, were found at high densities. These weeds should therefore be closely monitored. Other weeds which had high densities in fields where they were present and should be closely monitored include lambs-quarters (11.2 m^2), corn spurrey (10.8 m^2), volunteer buckwheat (10.1 m^2), chickweed (10.1 m^2), common groundsel (9.4 m^2), hempnettle (9.3 m^2), and field horsetail (7.5 m^2).

It is important to realize, however that densities do not take into consideration the size or competitiveness of the weeds. Ox-eye daisy and rough cinquefoil were found mostly in their seedling stage and were therefore very small and low growing. They did, however, have relatively high frequencies, field uniformities and densities. These weeds also had high relative abundances, but pose no threat to the harvesting of grain. Its main threat would arise from competition for nutrients and space. The cereal plants, however, can usually withstand the growth of these weeds below its canopy.

The final quantitative measure calculated was relative abundance. This ranked the weed species by quantitatively comparing all the individual species found with each other. Quackgrass (33.5), hempnettle (29.0), sheep sorrel (21.6), corn spurrey (20.6), ox-eye daisy (19.2), chickweed (18.7) and tufted vetch (16.5), were the top ranking weeds in New Brunswick cereal fields. These weeds should be continuously monitored to determine if populations are being controlled by present control methods and to ensure that populations do not increase even further.

CONCLUSIONS: The use of surveys is one of the most suitable and efficient means of obtaining information on the numeric abundance of individual weed species present in cereal fields. This survey provided information on the existing weed composition and abundance in New Brunswick cereal fields. It also provided baseline information for future survey comparisons. Shifts in weed populations due to changes in cereal management could therefore be monitored, and future weed problems could be predicted.

A total of 76 different weeds were found in New Brunswick cereal fields, indicating the diversity of weeds well adapted to survive the management practices associated with cereal production. There were relatively few dominant weed species in the surveyed cereal fields, but many different species were present and could potentially increase.

The most common and abundant weed species identified in the fields surveyed, ranked by relative abundance included: quackgrass, hempnettle, sheep sorrel, corn spurrey, ox-eye daisy, chickweed, and tufted vetch. Quackgrass and hempnettle populations must be monitored and regulated to acceptable levels. This survey indicated that weed research efforts should be directed towards these species in order to prevent further increases in these weed's frequency, field uniformity and density.

Weeds which are presently not a serious problem throughout all New Brunswick cereal fields, but may pose a serious threat in the future based on survey data include, field pansy, volunteer buckwheat and yellow nut sedge. Wild oats, bladder campion and yarrow should also be closely monitored. These weeds were problems in fields where they occurred, and it should be assured they do not spread in fields where they are presently non-existent or in small numbers. The extent of these weeds potential thrust, however, depends upon the life cycle, reproductive capability and size.

Knowledge of the life cycle and history of individual species could give an indication to which weed populations may be expected. It is possible that many annuals could be initially controlled, but due to large seed banks, can easily re-establish themselves. Also, perennial weeds with a strong rhizome system may be able to withstand herbicide application, and readily recover. Weeds may also be escaping control due to late season or intermittent germination times or poor application timing, rates and techniques.

Overall, more survey work is needed on a regular basis to observe if any weed population shifts are occurring and direct research toward new or improved control measures.

REFERENCES: Doohan, D., A.G. Thomas and S. Bouwer. Cereal Weed Survey 1985. Adaptive Research Reports Vol. 8, 1986. Plant Industry Branch, New Brunswick Dept. of Agriculture.

McCully, K.V. and D.J. Doohan, New Brunswick Cereal Weed Survey Update. Adaptive Research Report Vol. 9, 1987. Plant Industry Branch, New Brunswick Department of Agriculture.

TABLE 1: PROVINCIAL SUMMARY OF CEREAL WEEDS IN NEW BRUNSWICK

Species	Frequency (%)	Field Uniformity -----(%)-----		Field Density -----(#/M ²)-----		Density Range		Relative High	Abundance
		All	Occurrence	All	Occurrence	Low	High		
Quack Grass	53.1	23.1	43.5	12.8	24.0	0.4 -	144.6		33.5
Romp-nettle	75.2	29.9	39.8	7.0	9.3	0.2 -	91.4		29.0
Sheep Sorrel	66.4	21.7	32.7	4.8	7.2	0.2 -	122.8		21.6
Corn Spurrey	54.0	17.8	33.5	5.7	10.8	0.2 -	63.4		20.6
Ox-eye Daisy	55.8	21.6	38.7	3.9	7.0	0.2 -	78.4		19.2
Chickweed	50.4	16.2	32.2	5.1	10.1	0.2 -	96.8		18.7
Tufted Vetch	55.8	18.9	33.9	2.8	5.0	0.2 -	45.2		16.5
Annual Smartweed Species	66.4	14.2	21.5	1.5	2.3	0.2 -	36.8		13.7
Lamb's-Quarters	33.6	10.4	30.9	3.8	11.2	0.2 -	122.6		12.9
European Wood-Sorrel	39.8	10.0	25.2	2.2	5.5	0.2 -	56.6		10.9
Wild Buckwheat	38.1	8.5	22.2	0.8	2.2	0.2 -	14.8		8.0
Dandelion	38.1	7.4	19.5	0.5	1.4	0.2 -	8.8		7.1
Broad-Leaved Plantain	32.7	5.9	18.0	0.8	2.5	0.2 -	14.4		6.5
Rough Cinquefoil	22.1	5.2	23.4	1.0	4.5	0.2 -	34.8		5.5
Yellow Toadflax	16.8	3.7	22.1	0.7	4.3	0.4 -	12.8		4.1
Timothy	17.7	2.8	16.0	0.8	4.7	0.2 -	31.0		4.0
Yarrow	15.9	4.2	26.7	0.6	3.6	0.2 -	18.0		3.9
Low Cuckweed	25.7	2.5	9.8	0.2	0.8	0.2 -	3.2		3.6
Mouse-Eared Chickweed	20.4	3.2	16.6	0.3	1.7	0.2 -	11.6		3.6
Bladder Campion	13.3	3.8	28.3	0.5	3.5	0.2 -	18.4		3.3
Field Horsetail	9.7	2.2	22.3	0.7	7.5	0.2 -	52.8		2.8
Panic Grass	13.3	1.8	13.7	0.5	3.8	0.2 -	16.2		2.7
Canada Thistle	20.4	1.7	8.3	0.1	0.5	0.2 -	1.6		2.7
Pinesapleweed	15.0	2.1	14.1	0.3	2.0	0.2 -	25.0		2.7
Field Penny	6.2	1.5	25.0	0.9	14.8	0.2 -	85.2		2.6
Barnyard Grass	11.5	2.3	19.6	0.4	3.5	0.2 -	24.6		2.5
Wild Radish	14.2	2.1	15.0	0.2	1.5	0.2 -	7.4		2.4
Goldenrod Species	14.2	2.0	14.1	0.2	1.3	0.2 -	5.6		2.3
Smooth Bedstraw	11.5	1.5	13.5	0.4	3.6	0.2 -	22.8		2.3
Shepherd's-Purse	12.4	2.2	17.5	0.1	1.1	0.2 -	5.0		2.2
Alsike Clover	7.1	2.6	36.3	0.4	5.1	1.2 -	11.8		1.9
Canada Blue Grass	11.5	1.1	9.2	0.3	2.7	0.2 -	13.6		1.8
Perennial Sow-Thistle	9.7	1.6	16.8	0.2	2.1	0.2 -	9.0		1.7
Yellow Devil Hawkweed	9.7	1.5	15.0	0.1	1.5	0.2 -	6.6		1.7
Rough Fleabane	9.7	1.2	12.3	0.2	2.1	0.2 -	15.8		1.7
Black Medick	9.7	1.2	12.7	0.2	1.6	0.2 -	6.8		1.6
Grass-Leaved Stitchwort	5.3	1.4	25.8	0.3	5.7	0.4 -	20.4		1.5
Volunteer Oats	8.0	1.2	15.0	0.1	1.5	0.2 -	8.4		1.4
Wormseed Mustard	7.1	1.3	18.1	0.1	1.9	0.2 -	7.0		1.3
Volunteer Buckwheat	2.7	1.1	41.7	0.3	10.1	0.2 -	28.8		1.1
Wild Mustard	5.3	0.8	15.0 <	0.1	1.3	0.2 -	3.4		0.9
Unknown Grass	4.4	0.8	19.0	0.1	2.4	0.4 -	5.6		0.9

SURVEY OF VERTICILLIUM WILT OF ALFALFA IN NEW BRUNSWICK

Kelvin Lynch, Walter Brown, Roger Theriault,
Charles Goguen, Peter Scott, and Clinton McLean

ABSTRACT: Until 1988 Verticillium wilt of Alfalfa was not known to exist in New Brunswick. However, in this year, it was detected on 21 of 45 farms surveyed scattered throughout the alfalfa growing regions. Survey results indicated that this disease was present in the province for several years and pointed towards contaminated seed as a source of disease.

ENQUETE SUR LA VERTICILIOSE DE LA LUZERNE AU NOUVEAU-BRUNSWICK

Résumé: Avant 1988, la verticilliose de la luzerne n'avait pas été signalée au Nouveau-Brunswick. Elle l'a cependant été dans 21 des 45 exploitations agricoles situées dans l'ensemble des régions où se cultive la luzerne. L'enquête indique que cette maladie est présente dans la province depuis plusieurs années, et elle serait attribuable à une semence contaminée.

INTRODUCTION: Until 1988 it was assumed that New Brunswick was free of Verticillium wilt of alfalfa, although findings since then indicate this to have been unlikely. Brief surveys conducted in both 1980 and '81 as part of a national survey failed to detect the disease. In 1988, Verticillium wilt was found in plots at the Fredericton Research Station of Agriculture Canada. Since harvesting equipment used on these plots was also used in provincial surveys of commercial alfalfa fields a survey was initiated. This evolved into a program which covered approximately 150 fields and unfortunately revealed the disease to be present in several widely dispersed alfalfa growing areas. The original fear that machinery from the research station may have served as a source was not borne out by survey data.

MATERIALS AND METHODS: Fields were surveyed from August through to October mostly by personnel from the N.B. Department of Agriculture, but also in some cases by inspectors from the Agricultural Inspection Directorate of Agriculture Canada. Fields were classified into one of the following three groups: that is, not having sufficient regrowth for symptom expression, not having suspect plants, or as having chlorotic plants. Samples from fields in this suspect category were sent to the New Brunswick Plant Pest Diagnostic Laboratory for culturing.

Stem sections 1.5 cm long from the base of the plant were dipped in 95 percent alcohol and then immersed in 0.5 percent NaOCl for 3 minutes. This material was then rinsed in sterile water, aseptically split lengthwise and placed cut surface up on PDA. Approximately forty stem pieces representing 20 plants were cultured for each suspect field. Cultures were maintained under U.V. light

(12 hour photoperiod) and periodically examined for the presence of *Verticillium*. When subsequent culturing was required, this was carried out by transferring conidia to Difco Water Agar. A culture for pathogenicity evaluation was sent to Dr. H.C. Huang of the Lethbridge Research Station of Agriculture Canada.

RESULTS AND DISCUSSION: A total of 92 samples from 47 different farms were examined. Laboratory culturing for *Verticillium* was positive for 45 samples collected from 21 different farms scattered throughout the alfalfa growing regions. Of the 45 infested fields, 16 were planted to the variety Iroquois 7 Apica, 6 Minto and 16 were either other varieties, mixed plantings or the variety was unknown. With regard to year of planting, it was found that infested fields were evenly distributed between 1983 and '88. Since the disease appears to spread rapidly from field to field once introduced to a farm, little can be concluded on the original source of the disease in New Brunswick, however, one grower was confident that he had seen plants with typical *Verticillium* symptoms as early as 1984. The wide dispersal of *Verticillium* in the province on individual farms with no known connection would seem to point to contaminated seed sources as one possibility for the introduction.

NEMATODE CONTROL IN ESTABLISHED RASPBERRIES WITH VYDATE L

Roger Tremblay, Kelvin Lynch, Jacque Bérubé and
Alde Roussel

ABSTRACT: An application of Vydate L to established raspberries reduced population numbers of root lesion, pin, and spiral nematodes by more than fifty percent. However, a recovery of normal growth in this field prior to application of the Vydate made these results inconclusive. An application of Ridomil to the field during the previous fall may have been responsible for this turnaround in growth from the previous season when stunted areas were evident in the plantation.

LUTTE CONTRE LES NÉMATODES DANS UN CHAMP DE FRAMBOISIERS AU MOYEN DU VYDATE L

Résumé: Une application de Vydate L dans un champ de framboisiers établi a permis de réduire de plus de moitié la population de nématodes radicicoles, de nématodes acuminés et de nématodes à spirale. On avait toutefois constaté une reprise de la croissance normale des framboisiers dans ce champ avant l'application du Vydate, et les résultats obtenus ne sont donc pas concluants. Une application de Ridomil dans ce champ l'automne précédent pourrait être à l'origine de la reprise de croissance aux endroits où les framboisiers présentaient des signes évidents de rabougrissement.

MATERIALS AND METHODS: Vydate L nematocide was applied on May 16 to established raspberries at a rate of 9.35 l/ha. Plots were laid out as a paired t-test having 13 replicates. Application was with a single nozzle hand held gun delivering 11,000 l/ha. On June 30 a composite soil sample was taken for each plot by randomly inserting a soil probe 10 times to a depth of 15 cm. These samples were shipped immediately to J.W. Potter of the Vineland Research Station of Agriculture Canada for determination of plant pathogenic nematode species and numbers.

RESULTS AND CONCLUSIONS: Results in terms of nematode population reductions are given in Table 1. Sampling in the previous year had revealed 235 root lesion and 1690 spiral nematodes per kilogram of soil. Plant stand at that time was irregular with definite areas where the growth was stunted. In 1988 nematode numbers in non-treated plots were similar, whereas numbers in treated plots were reduced, although the reduction was not found to be statistically significant. Growth in 1988 was good and much more uniform perhaps due to an application of Ridomil in the fall of 1987. The recovery of uniform growth on the entire field makes conclusions on the benefit of Vydate difficult and this technology would require more study before it could become a generally recommended practice in New Brunswick.

ACKNOWLEDGEMENTS: Special thanks to John Potter of Agriculture Canada for the nematode extractions, identification and enumeration.

TABLE 1: EFFECT OF VYDATE ON NEMATODE POPULATIONS

Nematode	Source	<u>Population Numbers</u>		LSD.05
		Treated	Non-treated	
Stunt	soil (1 kg)	32	11	N.S.
Spiral	soil (1 kg)	1137	1712	N.S.
Pin	soil (1 kg)	60	294	N.S.
Root				
Lesion	soil (1 kg)	95	355	N.S.
Root				
Lesion	root (per gm dry wt.)	120	323	N.S.

WEED CONTROL IN CULTIVATED LOWBUSH BLUEBERRIES

K.V. McCully, S.J. LeBlanc and D.C. Hanscomb

ABSTRACT: An experiment was established to evaluate various herbicides on weed control and crop tolerance in cultivated lowbush blueberries. Visual weed control and crop tolerance ratings were taken throughout the summer. The most effective herbicide in controlling both broadleaf and grass weeds was hexazinone. None of the herbicides tested provided significant crop damage by the last rating date.

SUPPRESSION DES MAUVAISES HERBES DANS LES CHAMPS DE BLEUET NAIN CULTIVÉS

Résumé: Un essai réalisé dans des champs de bleuets nain a permis d'évaluer l'efficacité de divers herbicides contre les mauvaises herbes et de vérifier la tolérance des bleuets aux herbicides. Des observations visuelles ont eu lieu tout au long de l'été, et l'Hexazinone a été le meilleur herbicide pour la suppression des mauvaises herbes à larges feuilles et des graminées indésirables. Aucun des herbicides utilisés n'avait encore causé de dommages importants aux plants de bleuets à la dernière date de vérification.

INTRODUCTION: One of the major limiting factors in the commercial production of cultivated lowbush blueberries is weed control. Presently most growers are on a three-to-four year production cycle before they prune their blueberries. During this time, many annuals and perennials also start to establish themselves and compete with the blueberries for moisture, nutrients, light and space. These weeds must be controlled as early as possible before they get a chance to establish. Annual weed control can generally be accomplished but perennial broadleaf weeds and grasses are often a major problem and concern. This trial was established to evaluate various herbicides on crop tolerance and weed control, particularly dandelion.

MATERIALS AND METHODS: The trial was established in a cultivated lowbush blueberry field in New Denmark, Victoria County. Blueberries were planted in 1984 at a one metre row width in a silt loam soil having a pH of 5.2 and an organic matter content of 4.85%. Experimental design was a randomized complete block design with four replicates. Plot size was 2 m x 6 m. Herbicides were applied on April 26, 1988 (see table 1) when the crop was at a pre-emergence (PRE) stage. The post-emergence treatments of clopyralid and fluroxypyr were applied May 18. Treatments were applied with a CO₂ backpack sprayer in a water volume of 250 L/ha and at a pressure of 200 kPa. Weeds were in a post emergence (POST) stage. Rainfall was 14.5 mm five days prior to application and 10.6 mm ten days after. Visual ratings on crop damage and weed control were assessed May 18, June 23, July 26 and September 12. Logarithmic transformations were performed on the visual ratings and means separated by the Duncan's multiple range test.

RESULTS AND DISCUSSION: By the final evaluation date (September 12, 1988) there was no observable crop damage from any of the treatments (see Table I). Early seasonal damage (up to June 23, 58 days after application) however, was observed from both clopyralid rates, chlorsulfuron, fluroxypyr and terbacil treatments.

The worst weed present in the plots was dandelion (Taraxacum officinale Weber) which was already actively growing at application time. The two clopyralid rates, chlorsulfuron, hexazinone and fluroxypyr were the only treatments which provided initial dandelion suppression. The chlorsulfuron treatment was the fastest reacting, followed by fluroxypyr, clopyralid (0.6 kg (a.i.)/ha), hexazinone and clopyralid (0.4 kg (a.i.)/ha). Dandelion regrowth was quickest from the fluroxypyr, clopyralid and chlorsulfuron treatments respectively and by the final evaluation date (Sept. 12) only the hexazinone treatment provided control significantly different from the untreated plots. Grass control was also evaluated with the best treatments being hexazinone followed by the highest atrazine rate, atrazine + terbacil and terbacil. Although these treatments provided significant grass control as compared to the untreated control plot, they were not significantly different from one another.

TABLE 1: VISUAL RATINGS ON WEED CONTROL AND CROP DAMAGE

Treatment	Rate kg (a.i.)/ha	VISUAL RATINGS September 12, 1988		
		% Crop Damage	% BLW Control	% GRW Control
Control	-	0.0 n.s.	0.0 b	10.0 ef
Simazine	1.5	0.0	0.0 b	40.0 abcde
Terbacil	0.75	0.0	7.5 b	45.0 abcd
Atrazine	2.0	0.0	0.0 b	25.0 cdef
Atrazine	4.0	0.0	2.5 b	62.5 ab
Simazine +	1.5	0.0	0.0 b	10.0 def
Terbacil	0.4			
Atrazine +	2.0	2.5	0.0 b	55.0 abc
Terbacil	0.4			
Hexazinone	2.0	0.0	50.0 a	87.5 a
Chlorsulfuron	0.015	0.0	0.0 b	2.5 f
Clopyralid	0.4	0.0	7.5 b	0.0 f
Clopyralid	0.6	2.5	7.5 b	5.0 ef
Fluroxypur	0.45	0.0	0.0 b	5.0 ef
Diuron	2.3	0.0	5.0 b	17.5 bcdef
Metribuzin	0.6	0.0	0.0 b	15.0 cdef

* Principal weed was dandelion

CONCLUSIONS: Hexazinone was the most effective herbicide in controlling dandelion, the other broadleaf weeds and grasses. Initial dandelion suppression was observed with fluroxypyr clopyralid and chlorsulfuron treatments but regrowth levels were unacceptable. No significant crop damage was observed from any of the treatments.

Further work should be conducted in the fall as many of the dandelions had overwintered and started to grow as soon as the snow left. This would make the pre-emergence sprays with no foliar activity impractical.

ACKNOWLEDGEMENTS: Appreciation is extended to Anders Jensen who provided land for this trial.

OPERATION SPRAYCHECK

K.V. McCully and G.D. MacIntosh

ABSTRACT: A sprayer calibration program, initiated in 1986, was offered again in 1988 to help growers identify and correct problems resulting from poor sprayer performance. Of the 20 sprayers examined, only six machines were found to be calibrated to an acceptable level. Application errors ranged from less than 1% to levels which could not be computed by the computer.

VÉRIFICATION DES PULVÉRISATEURS

Résumé: Le programme de calibrage des pulvérisateurs lancé en 1986 s'est poursuivi en 1988 afin d'aider les agriculteurs à cerner et à rectifier les problèmes relatifs au mauvais rendement des pulvérisateurs. Sur les 20 pulvérisateurs examinés, seuls six d'entre eux étaient calibrés convenablement. Les erreurs d'application variaient de moins de 1 % à des niveaux que l'ordinateur ne pouvait traiter.

INTRODUCTION: One crop production area which is frequently overlooked is that of accurate pesticide application. Errors can and often do occur in calibration of sprayers and in the mixing of pesticides prior to spraying. This often results in dollars wasted and inefficient pesticide performance.

In the spring of 1986 an extension program entitled "Operation Spraycheck" was initiated by the Plant Industry Branch. The objectives of this program were to demonstrate correct sprayer calibration, sprayer problem diagnosis and the cost of misapplication. This program has been continued in the 1988 growing season and has met with favourable responses from growers participating in the clinics.

MATERIALS AND METHODS: Equipment for this program, developed by the Montana State University in 1982 was obtained by the Plant Industry Branch in the spring of 1986. This included a "spray pattern table" and computer software designed to assess the performance of each individual sprayer.

Seven clinics were held at various locations throughout the province: St. Quentin, Buctouche, Wicklow, Dalhousie, Tracadie, Newcastle and Chatham between May 30 and October 13, 1988. It has been found that three or four sprayers can be handled in an afternoon or evening. In the St. Quentin area, sprayers were calibrated on each person's farm whereas the other clinics involved calibrating 1 to 3 sprayers to groups of interested people. Approximately 100 people attended these various clinics. This year calibration bottles were also distributed and their use demonstrated to all people who attended the clinics. A number of individual

sprayers were also calibrated throughout the province upon request.

At the beginning of each clinic a brief introduction was made about the importance of proper sprayer calibration and about the "Spraycheck" program. The "spray pattern table" was then used on each sprayer to determine the optimum boom height, and identify nozzles which were the improper type, size, or badly worn or damaged. This table had two inch wide grooves which would spill into graduated cylinders across the width of the sample area. When the table was tipped on edge, the volume differences across the boom could be identified.

Each farmer was then asked to fill out a questionnaire concerning the type of equipment used, type of pump, size and type of nozzle tips, and the pesticide he intended to use, their rates and prices, and the water output he expected.

Next, the pressure gauge was checked against a standard gauge to test its accuracy. The pressure at various locations on the boom was also tested to determine if there was a drop in pressure in any of the lines. The flow rates were then measured for each individual nozzle across the boom. Finally the farmer was asked to run his machine over a measured distance in order to calculate the exact velocity while spraying.

All this information was then entered into the portable computer. The computer printout would compare the expected performance to the actual performance of the sprayer and make recommendations for improving application accuracy. These recommendations could include a new nozzle size, pressure, velocity or tank mix.

Finally, the printout would show the expected versus actual costs. If an overapplication was occurring, the printout would show how much money was being wasted for each hectare sprayed. Calibration bottles were also distributed and their use and effectiveness demonstrated.

CONCLUSIONS: Of the twenty sprayers tested this season, there were only six sprayers which were calibrated accurately. Even these sprayers had some problems (i.e. improper nozzle type, nozzle spacing, etc.). Most all sprayers examined throughout the province had some sprayer component not working properly or accurately. More time and attention must be spent on proper spraying calibration.

BEDSTRAW CONTROL IN TIMOTHY HAY FIELDS

K.V. McCully, S.J. LeBlanc and D.O. Hanscomb

ABSTRACT: A trial to evaluate various herbicides on their effectiveness in controlling bedstraw (*Galium mollugo* L.) within timothy hay fields was established. Visual ratings on weed control and crop damage were evaluated, and yields data collected. The best overall treatment for bedstraw control in timothy was mecoprop with 65% control and no crop damage. Glyphosate and hexazinone were also very effective in controlling bedstraw, but crop damage levels were unacceptable.

SUPPRESSION DU GAILLET MOLLUGINE DANS LES CHAMPS DE FLÉOLE DES PRÉS

Résumé: On a exécuté un essai pour évaluer l'efficacité de divers herbicides contre le gaillet mollugine (*Galium mollugo* L.) dans les champs de fléole des prés. L'observation visuelle de la suppression de cette mauvaise herbe et les dommages aux cultures ont été évalués, et l'on a recueilli des données sur les rendements. Le Mécoprop fut le meilleur herbicide contre le gaillet mollugine dans les champs de fléole, et il a supprimé 65 % de la mauvaise herbe sans causer de dommages aux cultures. Le Glyphosate et l'Hexazinone se sont également révélés efficaces, mais les dégâts aux plantes étaient trop considérables.

INTRODUCTION: One of the most complained about and widespread weeds to infest New Brunswick hay fields and neglected farm land is the thick growing, white blossomed perennial weed, bedstraw (*Galium mollugo* L.). Once established, it quickly develops a thick, fibrous root system, including rhizomes that spread underground. Bedstraw is difficult to harvest and has little nutritional value.

Bedstraw has been spreading rapidly, especially in fields where farmers are not plowing their fields or rotating their crops regularly. Bedstraw was first observed mostly in ditches where it has since spread into agricultural land. Presently there are no readily available registered herbicides that will control bedstraw in hay fields.

A herbicide screening trial was therefore established to evaluate various herbicides on their effectiveness in controlling bedstraw with minimal crop damage.

MATERIALS AND METHODS: The experiment was established at Cornhill, Kings County. Timothy was planted in 1986 at a seeding rate of 28 kg/ha in a silt loam soil having a pH of 7.2 and an organic matter level of 4.7%. The previous crop was also timothy. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. 170 kg/ha of 0-0-60 fertilizer was applied. Herbicides (see table 1) were applied to actively growing bedstraw (30 cm). They were applied with a CO2 backpack sprayer in a water volume of 250 L/ha at a pressure of 200 kPa. Rainfall was 30.4 mm five days

prior to application and 14.6 mm ten days after. Visual evaluation of crop phytotoxicity and weed control were assessed June 9, June 23, July 20 and August 18, 1988. Harvest was July 20. Analysis of variance was performed on the visual evaluations and yields. Means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSIONS: Results from the first rating period (13 days after application) until the last rating period (83 days after application) (see table 1) indicated that the fastest reacting and most phytotoxic treatments on bedstraw were glyphosate and hexazinone. However, crop damage, as expected, was much too high and unacceptable from these treatments. Glyphosate is a broad spectrum, non selective herbicide useful for controlling most weeds in a non cropping situation. Results from this trial indicate it could be effectively used for cleaning up fields in preparation for another crop to be planted. Hexazinone also effectively controlled bedstraw, but timothy and other grass crops are not tolerant. In the trial, some alfalfa was mixed in with timothy and was not injured. This indicated that if bedstraw is a problem in alfalfa, hexazinone could be effectively applied, if it were registered. Some initial high level control was also evident from metribuzin but bedstraw regrowth was unacceptable as the season progressed.

Until June 23 (27 days after treatment) all products except bromoxynil and the low rate of chlorsulfuron provided weed control significantly different from the untreated plots. However, only metsulfuron methyl, 2,4-DB, bentazon and 2,4-D + dichlorprop treatments resulted in crop damage not significantly different from the control.

At harvest time (July 20 - 54 days after application) the only products with significant weed control and crop damage not significantly different from the untreated control was dicamba + MCPA, 2,4-DB, bentazon, and mecoprop. By Aug. 18, 83 days after application only one product, mecoprop had significant weed control (65%) and no crop damage. Although this was the most effective and persistent treatment for bedstraw control in timothy, it is still a lower control level than desired. All the remaining products had either unacceptable weed control or crop damage levels.

None of the treatments resulted in significant yield increases as compared to the control, but it is important to remember that the control yields included many weeds and some alfalfa. Although most of the treatments had lower yields, timothy quality and quantity would have increased with the elimination of many of the weed

species. Treatments which were selective in killing the alfalfa would also have further reduced yields as compared to the control. Yields were significantly reduced, as expected, by hexazinone and glyphosate.

CONCLUSIONS: Glyphosate was effective in controlling bedstraw and could therefore be used for site preparation before planting a new crop. Hexazinone could be used to control bedstraw in alfalfa. Mecoprop was the only treatment which by the last rating date, significantly controlled bedstraw without significant crop damage. Control levels may still be too low and unacceptable for growers to feasibly apply this, however. Further work on mecoprop rates and timing is necessary to further increase control levels.

ACKNOWLEDGEMENTS: Appreciation is expressed to Harley Marr property owner, Cornhill, Kings Co., N.B. who provided land for the trial.

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TABLE 1: YIELDS AND VISUAL RATINGS ON CROP DAMAGE AND WEED CONTROL

Treatment	Rate kg (a.i.)/ha	VISUAL RATINGS August 18, 1988		Yield July 20 (T/ha)
		% Crop Damage	% Weed Control	
Control	-	0.0 f	0.0 c	11.67 ab
Mecoprop	1.1	0.0 f	65.0 b	9.36 ab
Hexazinone	2.5 +	97.5 a	82.5 a	2.89 c
+ Agral 90	0.25% v/v			
Chlorsulfuron	0.015 +	15.0 bcd	2.5 c	10.45 ab
+ Agral 90	0.25% v/v			
Chlorsulfuron	0.030 +	7.5 cdef	0.0 c	9.55 ab
+ Agral 90	0.25% v/v			
Metsulfuron Methyl	0.0045 +	7.5 cdef	2.5 c	11.28 ab
+ Agral 90	0.25% v/v			
Bentazon	1.75 +	12.5 cde	12.5 c	10.71 ab
+ Assist	2.0 L/ha			
Bromoxynil	0.35	7.5 cdef	12.5 c	11.03 ab
Bromoxynil	0.35 +	10.0 cdef	5.0 c	9.68 ab
+ Chlorsulfuron	0.015			
Chlorsulfuron +	0.015 +	7.5 cdef	2.5 c	9.93 ab
Metsulfuron Methyl	0.0045 +			
+ Agral 90	0.25% v/v			
2,4-DB Ester	1.72	17.5 bc	7.5 c	12.95 a
Metribuzin	1.1	25.0 b	0.0 c	8.27 b
Dicamba/MCPA	0.5	5.0 def	10.0 c	9.30 ab
2,4-D + dicamba	0.42+0.14	2.5 ef	2.5 c	9.55 ab
Glyphosate	3.0	100.0 a	95.0 a	0.20 d
2,4-D + Dichlorprop	0.5	1.7 ef	14.7 c	9.32 ab

Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's multiple range test.

WEED CONTROL IN ESTABLISHED ALFALFA

K.V. McCully, S.J. LeBlanc and D.O. Hanscomb

ABSTRACT: Pre-emergence, post-emergence and split applications of herbicides were applied to established alfalfa during the spring of 1988. To evaluate their effectiveness on weed control with minimal crop damage, visual ratings on crop damage and weed control, yield data and botanical composition were recorded. Although many treatments displayed initial injury symptoms on alfalfa, all treatments including the pre-emergence sprays which were sprayed to actively growing instead of dormant alfalfa, had recovered by July 27. The pre-emergence sprays of hexazinone, terbacil and metribuzin and the split applications of terbacil/paraquat, metribuzin/paraquat and paraquat applied alone, were the best overall treatments for percentage alfalfa and percentage weed control.

RÉPRESSION DES MAUVAISES HERBES DANS LES CHAMPS DE LUZERNE EN CULTURE

Résumé: Au printemps de 1988, on a procédé à des applications d'herbicide avant et après l'émergence ainsi qu'à des applications séquentielles dans des champs de luzerne en culture. Afin d'évaluer la mesure dans laquelle les herbicides supprimaient les mauvaises herbes tout en causant le moins d'altérations aux végétaux, on a procédé à une évaluation visuelle des dégâts causés et de la suppression des mauvaises herbes, et l'on a récolté des données sur le rendement et les variétés de mauvaises herbes répertoriées. Certains symptômes laissaient présager que de nombreux traitements abîmeraient la luzerne, mais tout était revenu à la normale le 27 juillet, y compris dans les cultures dont l'application avait eu lieu avant l'émergence sur une plante à l'état de croissance active plutôt qu'à l'état de dormance. Les produits appliqués avant l'émergence qui ont donné les meilleurs résultats étaient l'Exazinone, le Terbacil et le Métribuzin, et les meilleures combinaisons de produits étaient le Terbacil/Paraquat, le Métribuzin/Paraquat, et le Paraquat appliqué seul; ces produits ont endommagé le moins la luzerne et supprimé le plus de mauvaises herbes.

INTRODUCTION: In order for New Brunswick to provide a high degree of livestock feed self-sufficiency a number of incentives have been offered for producers to expand production. With these added incentives, alfalfa production is rapidly expanding. To ensure a long lasting and productive yielding crop over the years, effective weed control must be maintained. Presently, there are few registered products for alfalfa weed control. Therefore, to evaluate presently recommended registered products as well as non-registered products, a trial was established. Products registered for alfalfa include pre-emergence (PRE) soil applied herbicides which are recommended on dormant alfalfa, post-emergence (POST) herbicides recommended for alfalfa at the 1-3 trifoliate leaf stage and split applications which include a pre spray and a spray after the first cut. Alfalfa starts to grow early in the spring and many growers cannot get on their fields at the proper time. It is therefore not always possible to spray when the alfalfa is dormant. Therefore, the pre-emergence dormant sprays in the trial were applied when the alfalfa was actively growing at the 1-3 trifoliate leaf stage to evaluate their phytotoxicity on the alfalfa.

MATERIALS AND METHODS: The trial was conducted at Springfield, York County on a sandy loam having a pH of 6.6 and an organic matter level of 6.05%. Experimental design as a randomized complete block replicated four times with a plot size of 2m x 6m. Plots were fertilized with 19 kg/ha of 15-15-15 fertilizer and 400 kg/ha of 0-0-60 on May 3. Pre-emergence (PRE) herbicides (see Table I) were applied May 1, 1988. May 12 for the post emergence (POST) herbicides and June 17 for treatments applied after the first cut. Treatments were applied with a CO2 backpack sprayer delivering a water volume of 250 L/ha at a pressure of 200 kPa. The crop growth stage was 1-3 trifoliate for the pre-emergence herbicides and 3-5 for the post emergence. Weeds were early post emergence. Rainfall was 20.6 mm five days before first application and 1 mm after. The second application received 8.4 mm five days before and 54.8 mm ten days after while the third application received 2.8 mm five days before and 18 mm ten days after. Visual evaluations on crop phytotoxicity and weed control were May 12, June 3, July 6, July 27 and September 2. Density counts were taken August 8 using 50 cm² quadrats. One count was taken from each quadrat. The Farmer accidentally ruined results from first harvest but the second harvest was taken August 8. Logarithmic transformations on yield and visual evaluations were performed while the means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION: Crop Damage - Crop damage was expected to be high from the pre-emergence soil applied herbicides, since treatments were applied to actively growing alfalfa instead of recommended dormant alfalfa. The only treatment not causing significant crop damage at this time was simazine. The remaining hexazinone, metribuzin, and terbacil treatments all provided damage significantly differently from the control but not each other. After the first cut was taken and the season progressed, these treatments recovered and were not significantly different from the control (see Table 1).

The post-emergence herbicides applied eleven days after the first soil applied treatments (May 12) also displayed injury symptoms by the June 3 evaluation date. All treatments containing 2,4-DB, whether alone or in a tank mix were the most phytotoxic. Treatments containing AC 263,499 and basagran did not significantly damage the alfalfa. By July 6, 55 days after application, all the treatments had recovered to damage levels not significantly different than the control.

The split applications of terbacil or metribuzin applied May 1, followed by paraquat and paraquat applied alone after the first cut (June 17) resulted in significant damage when evaluated 19 days later. These treatments

however recovered and by July 27 damage was not significantly different than the control.

Overall, by July 27 none of the treatments, irregardless of application timing resulted in crop damage significantly different from the untreated control plots.

Although the first alfalfa cut was unable to be evaluated, it is very likely that yield differences would have been observed. Yields taken from the second cut although varying from treatment to treatment, indicated that the alfalfa had recovered, resulting in no significant yield differences (see Table II).

Weed Control - Simazine was the only pre-emergent herbicide applied May 1 which did not provide significant weed control as compared to the untreated control plot. This could be expected since Simazine is a pre-emergent herbicide with no foliar activity and many of the weeds had already emerged.

The only product applied post-emergence (May 12) which provided any significant weed control 22 days later was AC 263,499. The standard 2,4-DB provided no significant weed control. The residual soil applied pre herbicides still provided significant control at this time.

After the first cut and after paraquat was applied, the best treatments included metribuzin + paraquat, terbacil + paraquat, paraquat, followed by hexazinone, metribuzin and terbacil. By the final rating (see Table 1) the treatments providing weed control significantly different from the control were metribuzin + paraquat, hexazinone, terbacil, terbacil + paraquat, metribuzin, and paraquat. The remaining treatments, did not provide significant weed control.

Although the products which provided the significant weed control did not result in significant yield increases, it can be seen from the Botanical Composition (Table II) that generally the treatments with significant weed control had the highest alfalfa percentage and lowest weed percentage. Alfalfa quality would therefore be higher.

CONCLUSIONS: Although initial damage can be expected from many of the treatments applied, irregardless of the application time, recovery by the end of the season can be expected. Fertilization and new regrowth from harvesting the alfalfa, following herbicide application could account for this. Results indicate that dormant sprays may be applied between the 1-3 trifoliate leaf stage with eventual recovery.

TABLE 1: WEED CONTROL AND CROP DAMAGE - VISUAL RATINGS

Treatment	Rate kg(a.i.)/ha	Timing		VISUAL RATINGS		
		PRE-May 1 POST-May 12 SPLIT-June 17	Damage	September 2 % Crop	% Weed	Control
Control	-	-	-	0 n.s.	0 e	0 e
Simazine	0.5	PRE	PRE	0	10.0 de	10.0 de
Terbacil	0.56	PRE	PRE	7.5	42.5 bc	42.5 bc
Paraquat	0.65	1ST CUT	1ST CUT	22.5	27.5 cd	27.5 cd
Terbacil; Paraquat	0.56; 0.65	SPLIT	SPLIT	0	42.5 bc	42.5 bc
Metribuzin	0.75	PRE	PRE	0	32.5 bc	32.5 bc
Metribuzin; Paraquat	0.75; 0.65	SPLIT	SPLIT	0	62.5 a	62.5 a
2,4-DB	1.4	POST	POST	5.0	7.5 e	7.5 e
AC 263, 499	0.10	POST	POST	0	5.0 e	5.0 e
AC 263, 499	0.15	POST	POST	5.0	12.5 de	12.5 de
Bentazon	0.56	POST	POST	2.5	0 e	0 e
2,4-DB + Bentazon	0.5 + 0.56	POST	POST	5.0	5.0 e	5.0 e
Pyridate + 2,4-DB	0.9 + 0.5	POST	POST	0	5.0 e	5.0 e
Pyridate	1.0	POST	POST	2.5	2.5 e	2.5 e
Hexazinone	0.5	PRE	PRE	0	47.5 ab	47.5 ab

Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's multiple range test.

TABLE II: YIELD AND BOTANICAL COMPOSITION FROM THE SECOND ALFALFA CUT

Treatment	Rate kg(a.i.)/ha	BOTANICAL COMPOSITION		Yield-2nd cut August 8 T/ha
		% Alf.	% BLW & Grass	
Control	-	68.2	25.1	8.78 N.S.
Simazine	0.5	58.7	33.2	9.17
Terbacil	0.56	78.0	16.9	6.41
Paraquat	0.65	49.9	42.4	9.62
Terbacil; Paraquat	0.56; 0.65	91.5	2.7	8.14
Metribuzin	0.75	75.5	17.7	8.07
Metribuzin; Paraquat	0.75; 0.65	82.9	9.2	9.04
2,4-DB	1.4	60.8	35.9	9.04
AC 263, 499	0.10	62.9	31.3	8.08
AC 263, 499	0.15	85.7	11.2	8.08
Bentazon	0.56	43.3	53.2	9.61
2,4-DB + Bentazon	0.5 + 0.56	41.9	55.8	9.62
Pyridate + 2,4-DB	0.9 + 0.5	62.7	33.9	9.30
Pyridate	1.0	71.0	24.7	9.81
Hexazinone	0.5	75.3	20.3	8.01

Alfalfa yields although varying from one another were not significantly different from each other or the control possibly since many of the weeds were annuals and would have been controlled by the two mowings instead of by herbicides only. Although the yields do not indicate it, the treatments with the highest visual ratings for weed control also had the highest % alfalfa and lowest % broadleaf weeds when examining botanical composition. Terbacil followed by paraquat after the first harvest resulted in the highest % alfalfa and lowest % weed control (% blw + % grass).

Weed control was helped with the addition of paraquat after the first cut but not enough to offset the additional cost. The pre-emergence residual herbicides (except simazine) otherwise provided the best season long control. Poor weed control was achieved with the standard 2,4-DB treatment.

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QUACKGRASS CONTROL IN ESTABLISHED ALFALFA

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ABSTRACT: A trial to evaluate various registered and non-registered products on their effectiveness in controlling quackgrass with no associated crop damage was conducted. Visual ratings on crop damage and quackgrass control were collected along with quackgrass shoot densities, alfalfa yields, and botanical composition. The most effective treatments by the end of the assessment date in terms of visual weed control, quackgrass shoot densities, and actual alfalfa yields were UBI 9076 + assist treatments applied at 0.105 kg(a.i.)/ha and 0.150 kg(a.i.)/ha with 2.0 L of assist.

RÉPRESSION DU CHIENDENT DANS LES CHAMPS DE LUZERNE EN CULTURE

Résumé: Un essai a permis d'évaluer l'efficacité de divers produits homologués et non homologués contre le chiendent sans qu'ils occasionnent d'altérations à la luzerne. On a recueilli des données sur les dommages à la récolte et sur le taux de suppression, sur la densité des pousses de chiendent, sur le rendement de la luzerne et sur les variétés de mauvaises herbes répertoriées. D'après l'observation visuelle de la suppression des mauvaises herbes, des densités des pousses de chiendent et des rendements réels de la luzerne, les meilleurs résultats obtenus à la fin de l'évaluation étaient attribuables aux produits UBI 9076 et Assist appliqués à raison de 0,105 kg(i.a.)/ha et de 0,150 kg(i.a.)/ha avec deux litres d'Assist.

INTRODUCTION: Quackgrass, a perennial grass, is one of the most troublesome weeds in North America. A shoot from a single rhizome bud without competition is capable of producing 90 m of rhizome per year (Hay, 1962). Quackgrass is a serious threat in forage crop land because it interferes with the establishment and persistence of the crop. Quackgrass shortens the productive life of alfalfa stands and necessitates growers to renovate their fields earlier than when adequate control measures are applied (Leroux, 1987).

With the increased emphasis on alfalfa production within New Brunswick, quackgrass will most likely be one of the weed problems. A trial was therefore established to evaluate various registered and non-registered graminicides on their effectiveness in controlling quackgrass in alfalfa.

MATERIALS AND METHODS: This trial was established in Sussex, Kings County in a sandy loam soil having a pH of 7.3 and an organic matter content of 3.9%. O.A.C. Minto alfalfa was planted on May 20, 1987 at a seeding rate of 13.64 kg/ha. 340 kg/ha of 5-10-30 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was alfalfa. Herbicides (see Table 1) were applied May 27, 1988 when the crop growth stage was 25-30 cm and the quackgrass was in the 4-6 leaf stage. They were applied using a CO₂ backpack sprayer in a water volume of 200 L/ha at a pressure of 200kPa. Visual

assessment of crop phytotoxicity and weed control were taken June 10, June 24, July 22 and August 18, 1988. Harvests were taken on June 27 and September 1. Density counts were taken in permanent 50 cm² quadrats before the first cut on June 24 and before the second cut on September 1. Rainfall was 30 mm five days prior to application and 20 mm ten days after. Logarithmic transformations were performed on the visual evaluations and yields and the means were separated by Duncan's multiple range test.

RESULTS:

Crop Damage

Two weeks after initial herbicide application, all treatments caused significant crop damage as compared to the untreated control. The UBI 9076 products were the most phytotoxic and the DPXY-6202-31 + Canplus 411, sethoxydim + Assist + AmSO₄ (0.50 kg(a.i.)/ha) + 2L + 4.0L and fluazilop-butyl EC + Agral 90 treatments were the least phytotoxic.

Visual ratings taken just prior to the first harvest (see Table 1) indicated that the alfalfa was recovering from most treatments. Sethoxydim + Assist + AmSO₄, DPXY-6202-31 and RE 45601 + COC (0.150 kg(a.i.)/ha + 1% v/v) treatments now had damage levels not significantly different from the untreated control.

Assessment of alfalfa regrowth subsequent to the first harvest indicated that recovery can be expected with damage levels not significantly different than the untreated control (52 days after application) from all treatments.

Weed Control - Quackgrass

Two weeks after initial application, all treatments significantly suppressed quackgrass as compared to the untreated control. The RE45601 and sethoxydim treatments were the fastest reacting and the UBI 9076 and DPXY-6202-31 treatments the slowest reacting.

Visual ratings taken just prior to the first harvest (June 24) (see Table 1), indicated that all the treatments except DPXY-6202-31 provided significant quackgrass suppression (see Table 1). Quackgrass shoot densities taken at this time, however, did not indicate any significant differences between treatments or the untreated control. This could be explained by the fact that density counts would still have included dying quackgrass that visually would have been assigned a crop damage rating. Sethoxydim + Assist + AmSO₄ had the

lowest quackgrass densities followed by fluazifop - butyl EC and UBI 9076 (0.105 and 0.150 kg(a.i.)/ha rates).

By July 22, (56 days after application), only UBI 9076 + Assist (0.105 and 0.150 kg(a.i.)/ha + 2.0L rates) and RE 45601 + COC (0.150 + 1% v/v) resulted in quackgrass control significantly different from untreated plots. These treatments therefore had more residual and/or translocation movement than the other treatments.

By the last assessment date (August 18), 83 days after application, only the UBI 9076 + Assist (0.105 and 0.150 kg(a.i.)/ha + 2.0 L) treatments resulted in quackgrass control significantly different from the untreated plots (see Table II). Quackgrass densities taken at this time coincided with these visual assessments.

By this last assessment date, the sethoxydim + Assist (0.80 kg(a.i.)/ha + 4.0 L) was more effective than the sethoxydim + Assist + AmSO₄ (0.50 kg (a.i.)/ha + 4.0 L + 2.0 L) although not significantly. There were no significant differences between the RE 45601 rates and there was not any advantage to mixing AmSO₄ with the RE 45601 products. No significant differences existed between fluazifop-butyl EC and the Dry flowable (DF) formulations, however, quackgrass densities were lower with the emulsifiable concentrate (EC) formulation. DPXY-6202-31 resulted in unexpected poor quackgrass control. Reasons for its poor performance are not understood. The low rate of UBI 9076 is not high enough for long term significant weed control.

Crop Yields and Botanical Composition

Yield data from the first harvest (June 27 - 31 days after application) indicated that the highest yields came from the control and the only treatment not significantly different was DPXY-6202-31 (see Table I). When examining alfalfa yield data, it is important to remember that yields include alfalfa, grass weeds and broadleaf weeds all combined. Therefore, the highest yielding treatments are not necessarily the best since it does not contain pure alfalfa. To give a better indication of plot yields, botanical compositions were determined. It must be remembered, however, that botanical compositions do not necessarily give a breakdown of the yields by weight since it is based on counts and not weight. For example, there may be only 30% broadleaf weeds but they could weigh more than the 70% alfalfa. However, in this trial, the botanical composition, although based on counts is felt to be an accurate percentage breakdown of the yields as well.

When this is considered, the highest yielding pure alfalfa treatment was from the sethoxydim + Assist + AmSO₄ (0.50 kg(a.i.)/ha + 2.0 L + 4.0 L) mixture (12.98 x 45.5% = 5.9) followed by fluazifop-butyl EC + Agral 90, UBI 9076 (0.105 kg(a.i.)/ha + 2L) and RE 45601 + COC (0.150 kg(a.i.)/ha + 1% v/v). Generally, the highest yielding treatments of actual alfalfa had the lowest quackgrass shoot densities.

Overall yield data from the second harvest (Sept. 1 -97 days after herbicide application) indicated that there were no significant differences between treatments or the control (see Table 2). The highest yielding treatments of actual alfalfa, based on the percentage alfalfa of the total yield were UBI 9076 + Assist (0.105 kg(a.i.)/ha + 2L) followed by UBI 9076 + Assist (0.150 kg(a.i.)/ha + 2.0L), RE 45601 + COC (0.150 kg(a.i.)/ha + 1% v/v) and fluazifop - butyl EC + Agral 90 (0.5 kg(a.i.)/ha + 0.1% v/v). These were also the treatments with the lowest quackgrass shoot densities.

DISCUSSION AND CONCLUSION: Results from the trial indicate that initial significant crop injury may result from the tested herbicides. However, recovery on alfalfa regrowth subsequent to the first harvest can be expected by 52 days after application with damage levels not significantly different from the control.

Evaluation of visual quackgrass control ratings just prior to the first harvest indicated that all treatments except DPXY6202-31 resulted in significant quackgrass suppression. The best of these treatments included the UBI 9076 high rate, RE 45601 + COC + AmSO₄ (0.15 kg(a.i.)/ha + 1% v/v + 4.0L), RE 45601 + COC (0.180 kg(a.i.)/ha + 1% v/v), sethoxydim + Assist (0.80 kg(a.i.)/ha + 4.0L) and UBI 9076 + Assist (0.105 kg(a.i.)/ha + 2.0L). No significant differences existed between quackgrass shoot densities taken at this time because the herbicide treatments only suppressed or stunted the quackgrass. The actual quackgrass shoot itself was still present in most cases, and had been counted.

Yield data based on the actual amount of alfalfa present in the total yield (% alf x yld) indicated that the sethoxydim + assist + AmSO₄ (0.50 kg(a.i.)/ha + 2.0 L + 4.0 L) treatment, followed by fluazifop-butyl EC, UBI + 9076 + Assist (0.105 kg(a.i.)/ha + 2.0 L), RE 45601 + COC (0.15 kg(a.i.)/ha + 1% v/v) and sethoxydim + Assist (0.8 kg(a.i.)/ha + 4.0 L) were the highest yielding treatments. Generally, when quackgrass densities were the lowest, actual alfalfa yields were the highest.

By the second harvest (Sept. 1 - 97 days after application), there were only two treatments (UBI 9076 + Assist applied at 0.105 and 0.150 kg(a.i.)/ha + 2.0L) with visual quackgrass control and quackgrass shoot densities significantly different from the untreated control. These two treatments also had the highest actual alfalfa yields, % alfalfa and the lowest % grass weeds within the total yield. There does not appear to be any advantage in applying the 0.15 kg(a.i.)/ha over the 0.105 kg(a.i.)/ha rate however. Other promising treatments included RE 45601 + COC (0.150 kg(a.i.)/ha + 1% v/v) and the low UBI 9076 rate.

Information gathered around the second harvest date would be of more use in trying to pick an effective herbicide since it would be evaluating quackgrass regrowth following herbicide application and harvesting.

Quackgrass shoot densities went down from counts taken before the first harvest to before the second harvest since first counts would have included quackgrass which may have been suppressed and dying and final counts would have involved only quackgrass which had survived and was actively growing. It also appears that intraspecific competition may have been occurring when high quackgrass densities were present, since control plot shoot counts also decreased dramatically from the first to second count.

Although total alfalfa yields did not increase from the first harvest to the second for most treatments, the actual alfalfa present in the second harvest total yield generally did. This indicated that less quackgrass and more alfalfa was present in the final yield signifying effective quackgrass control from many of the treatments.

Looking at the products specifically, there were no significant differences between the RE 45601 rates and mixtures when examining percent quackgrass control and quackgrass shoot densities. There were no significant differences between the fluazifop - butyl formulations, however, the emulsifiable concentrate (E.C.) did have lower shoot densities at both counts. The DPXY-6202-31 product surprisingly and unexplainably provided no significant differences from the control for any parameters evaluated. By the second harvest, it appears that the fluazifop treatments may be more effective than sethoxydim treatments in reducing quackgrass shoots.

REFERENCES: Hay, J.R. 1962. Biology of Quackgrass and Some Thoughts on its Control. Down Earth. 18.14-16.

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TABLE 1: VISUAL RATINGS, DENSITY COUNTS, AND BOTANICAL COMPOSITION AT THE FIRST HARVEST

Treatment	Rate kg(a.i.)/ha	TIMING (Leaf stage)	June 24		Quack Density Shoot Pre 1st Cut	Forage Yield 1st cut (T/ha)	Botanical Comp %		
			Visual Rating	Damage			Alf	GRW	BLW
fluazifop-butyl EC + Agral 90	0.5+0.1% v/v	4-6	10 ab	27.5 ab	256 N.S.	12.58 bcd	36.6	51.7	11.7
Fluazifop-p- butyl DF+Sup.Oil.Conc.	0.25+1% v/v	4-6	15 ab	30.0 ab	478	14.05 b	17.8	76.7	5.5
DPXY-6202-311+ +Canplus 411	0.072+1.0% v/v	4-6	7.5 bc	2.5c	521	16.32 a	17.6	76.7	5.7
RE 45601+COC	0.150+1% v/v	4-6	7.5 abc	27.5 ab	404	13.96 bc	27.7	70.7	5.6
RE 45601+COC+ AmSO4	0.150+1%v/v+ 4.0L	4-6	12.5 ab	37.5 ab	387	12.22 bcd	18.7	65.5	14.8
RE 45601+COC	0.180+1%v/v	4-6	15.0 ab	35.0 ab	423	11.92 bcd	21.1	72.8	6.1
RE 45601+COC+ AmSO4	0.180+1%v/v+ 4.0L	4-6	10 ab	32.5 ab	435	13.02 bcd	10.1	84.3	5.6
Sethoxydim + Assist	0.80 +4L	4-6	12.5 ab	35 ab	408	11.42 d	27.8	61.7	7.5
Sethoxydim + Assist + AmSO4	0.50+4.0L+2L	4-6	5.0 bc	22.5 ab	249	12.98 bcd	45.5	44.6	9.9
UBI 9076+Assist	0.072 + 2L	4-6	25 a	22.5 b	381	11.79 cd	22.1	71.5	6.4
UBI 9076+Assist	0.105 + 2L	4-6	12.5 ab	35.0 ab	315	11.92 bcd	34.7	57.4	7.9
UBI 9076+Assist	0.150 + 2L	4-6	17.5 ab	40.0 a	320	12.16 bcd	21.7	68.7	9.6
Control	-	-	0 c	0 c	560	17.4 a	14.3	80.2	5.5

TABLE 2: VISUAL RATINGS, DENSITY COUNTS AND BOTANICAL COMPOSITION AT THE SECOND HARVEST

Treatment	Rate kg(a.i.)/ha	TIMING (Leaf stage)	Aug. 18		Quack Density Shoot Pre 1st Cut	Forage Yield 1st cut (T/ha)	Botanical Comp		
			Visual Damage	Visual Rating % weed Control			% Alf	% GRW	% BLW
Fluazifop-butyl EC + Agral 90	0.5+0.1% v/v	4-6	5 N.S.	2.5 C	161 a	9.45 N.S.	46.2	45.1	8.7
Fluazifop-p- butyl DF+Sup.Oil.Conc.	0.25+1% v/v	4-6	2.5	7.5 bc	203 a	10.14	37.1	56.5	6.4
DPXY-6202-311+ +Canplus 411	0.072+1.0% v/v	4-6	15.0	0 C	241 a	8.36	31.1	62.4	6.5
RE 45601+COC	0.150+1% v/v	4-6	10	0 C	147 a	9.95	45.5	45.5	9.0
RE 45601+COC+	0.150+1%v/v+	4-6	5	10.0 bc	155 a	9.45	40.6	49.2	10.2
AmSO4	4.0L								
RE 45601+COC	0.180+1%v/v	4-6	7.5	12.5 bc	158 a	10.09	41.2	47.9	10.9
RE 45601+COC+	0.180+1%v/v+	4-6	2.5	10.0 bc	227 a	8.62	29.3	62.0	8.7
AmSO4	4.0L								
Sethoxydim + Assist	0.80 +4L	4-6	7.5	12.5 bc	251 a	9.43	31.2	62.6	6.2
Sethoxydim + Assist + AmSO4	0.50+4.0L+2L	4-6	5.0	7.5 C	212 a	9.45	34.6	58.7	6.7
UBI 9076+Assist	0.072 + 2L	4-6	2.5	10.0 bc	157 a	10.01	43.4	46.0	10.6
UBI 9076+Assist	0.105 + 2L	4-6	0	22.5 ab	46 b	9.73	63.4	20.3	16.3
UBI 9076+Assist	0.150 + 2L	4-6	0	40.0 a	31 b	9.60	47.7	33.6	18.7
Control	-	-	0	0 C	196 a	9.19	33.5	54.3	12.2

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CROP TOLERANCE AND WEED CONTROL ON FORAGE BRASSICA'S AND FORAGE BEETS

K.V. McCully and C. McLean

ABSTRACT: A trial to evaluate the phytotoxicity and weed control of three trifluralin rates on forage kale, forage rape, stubble turnips and forage beets was established July 5, 1988. Visual crop damage and weed control were evaluated and crop yields collected. Results indicated that the trifluralin rates evaluated can be safely applied on kale, rape and turnips, but not beets.

TOLÉRANCE DES PLANTES ET EFFICACITÉ DE L'HERBICIDE UTILISÉ SUR LE CHOU FOURRAGER ET LA BETTERAVE FOURRAGÈRE

Résumé: Un essai a été réalisé à partir du 5 juillet 1988 pour évaluer la phytotoxicité et l'effet herbicide de trois taux d'application de Trifluralin sur le chou frisé fourrager, la navette, le navet fourrager et la betterave fourragère. Les altérations causées par le produit et son efficacité contre les mauvaises herbes ont été évaluées visuellement, et l'on a recueilli des données sur le rendement. Les résultats indiquent que les taux de Trifluralin mis à l'essai peuvent être appliqués sans danger sur le chou frisé, la navette et le navet, mais non sur la betterave.

INTRODUCTION: Recently in New Brunswick there has been an increased interest in forage brassica's (kale, rape, turnips) and forage beets as annual pasture crops. One of the major limitations facing the establishment of these crops is effective weed control. Many brassica's are tolerant to trifluralin, however little crop tolerance data has been collected on forage brassicas. Beets exhibit little tolerance to trifluralin but whether this is a rate response or not is not known.

A trial was therefore established to evaluate three trifluralin rates on forage kale, forage rape, stubble turnips and forage beets to determine how tolerant these crops are to trifluralin.

MATERIALS AND METHODS: The trial was established at Grand Falls, Victoria County. Different forage brassicas including kale, rape, turnip and forage beets were planted July 5, 1988. Experimental design was a randomized complete block design replicated four times. Plot size was 2m x 7m. Rainfall was 20.6 mm five days before application and 48.7 mm ten days after. Visual evaluations on crop phytotoxicity and weed control were taken July 27, August 30 and September 26. Samples were harvested October 26 and October 27. A Rem harvester was used to harvest a 65 cm strip from the center of the rape and kale trials. Yields of beets and turnips were collected from two 1 m² quadrats within each plot. Logarithmic transformations were performed on the visual ratings and the means separated by Duncan's multiple range test.

RESULTS AND DISCUSSION: No significant crop injury, as compared to the untreated control, was observed on the brassica's: kale, rape or turnips from any of the trifluralin rates, during any of the assessment dates. As well, no significant differences existed between the three rates tested. Significant crop injury, however, was observed during all assessment dates, as compared to the untreated control, when trifluralin was applied to the forage beets. Degree of injury was rate dependant and the three trifluralin rates were significantly different from each other. The higher the rate, the higher the damage observed.

Weed control was excellent in most all kale, rape, turnip and beet plots. However, no significant weed control resulted from any of the treatments throughout the entire season. As well no significant differences existed between the three rates tested. This resulted because there were very few weed seeds initially present and any that germinated were smothered out by the thick foliage associated with the planted crops.

Although yields varied there were no significant yield differences in rape, kale or beets, from the three trifluralin treatments as compared to the untreated control (see Table 1). Beets although having significant crop damage from all rates, had yields surprisingly not significantly different than the control. Reasons for this could be attributed to the high beet seeding rate. As beets were damaged and died out, they lowered the beet density within plots. This permitted the unaffected beets to grow much larger than the average beet size in the control plot and increase the beet yields.

Turnips were the only crop whose yields were affected by trifluralin treatment. Trifluralin applied at 0.5 Kg(a.i.)/ha resulted in yields significantly higher than the untreated control. This treatment was however not significant from the other trifluralin rates.

CONCLUSION: Trifluralin, regardless of the rate can be applied with no significant crop damage to the forage brassica's: kale, rape and turnip. This was expected since a number of the brassica family members exhibit tolerance to trifluralin. Forage beets (chenopodiaceae) however displayed significant crop injury symptoms and death from all trifluralin rates as compared to the untreated control.

Evaluation of weed control was difficult because there were very few weeds initially present in the plots and weeds which did germinate were often smothered out from the thick crop canopy. As a result, no significant weed control existed in any of the crops at any rate.

TABLE 1: YIELD AND VISUAL RATINGS

Treatment	Rate kg (a.i.)/ha	July 27		August 30		October 26		Yield % Weed Control	% Crop Damage	% Weed Control	Oct. 26 T/ha
		% Crop Damage	% Weed Control	% Crop Damage	% Weed Control	% Crop Damage	% Weed Control				
Kale	-	0.0 *	80.0 *	30.0 *	65.0 *	N/A	65.0 *	65.0 *		30.37*	
	0.5	0.0	82.5	30.0	62.5		62.5	55.0		25.16	
	1.0	2.5	90.0	30.0	67.5		67.5	65.0		26.24	
	1.5	0.0	80.0	30.0	65.0		65.0	86.3		29.74	
Rape	-	0.0 *	95.0 *	30.0 *	90.0 *		90.0 *	100.0 *		26.82*	
	0.5	5.0	95.0	30.0	90.0		90.0	100.0		25.92	
	1.0	0.0	90.0	30.0	87.5		87.5	100.0		26.40	
	1.5	0.0	92.5	30.0	90.0		90.0	100.0		23.82	
Turnip	-	2.5 *	77.5 *	27.5 *	72.5 *		72.5 *	100.0 *		78.83b	
	0.5	0.0	85.0	25.0	80.0		80.0	100.0		103.63a	
	1.0	2.5	82.5	27.5	80.0		80.0	100.0		93.50ab	
	1.5	2.5	82.5	22.5	80.0		80.0	100.0		91.90ab	
Beets	-	0.0 a	75.0 *	27.5 a	65.0 *		65.0 *	77.5 *		67.83 *	
	0.5	42.5 b	75.0	40.0 b	65.0		65.0	50.0		43.88	
	1.0	50.0 c	67.5	50.0 c	50.0		50.0	60.0		48.48	
	1.5	75.0 d	75.0	72.5 d	62.5		62.5	67.5		53.41	

N/A - not available

Asterisk (*) represents that the means are not significantly different at the 0.05 level of significance according to Duncan's multiple range test.

Turnips were the only crop which resulted in a significant yield increase from any trifluralin rate. Trifluralin applied at 0.5 kg (a.i.)/ha resulted in a significant yield increase as compared to the untreated control.

Although beet yields from the trifluralin rate were not significantly different from the control they could not be recommended. Larger beets present in trifluralin plots where beet densities were lower due to crop damage, resulted in yields not significantly different from the untreated plots. Under proper seeding rates and spacings it is felt that yields would have been reduced.

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WEED CONTROL IN SEEDLING ALFALFA

K.V. McCully, L. Cornish, S.J. LeBlanc and D.O. Hanscomb

ABSTRACT: A trial to evaluate both registered and non-registered products in seedling alfalfa was established to determine which products would provide maximum weed control with minimal crop damage. Visual ratings on crop damage, broadleaf weed control and grass weed control were taken. Yield data with an associated botanical composition were also collected. Results indicated that all treatments tested could be expected to provide significant weed control with no significant crop damage 59 days after post emergent application. The best overall treatment was 2,4-DB + bentazon + sethoxydim + assist + AmSO₄. A split application of the ppi, eptc or trifluralin treatments followed by 2, 4 -DB, were more effective in controlling both broadleaf and grass weeds than if applied alone.

SUPPRESSION DES MAUVAISES HERBES DANS LES JEUNES PLANTS DE LUZERNE

Résumé: Un essai a permis d'évaluer des produits homologués et non homologués et de déterminer ceux qui sont le plus efficaces contre les mauvaises herbes tout en produisant le moins de dommages à la luzerne. On a évalué visuellement les dégâts causés et la suppression des mauvaises herbes à larges feuilles et des graminées indésirables, en plus de recueillir des données sur le rendement selon la variété répertoriée. Les résultats obtenus 59 jours suivant l'application d'un traitement après l'émergence indiquent que tous les traitements à l'essai sont très efficaces contre les mauvaises herbes et peu dommageables pour les plantes. Le traitement qui a donné les meilleurs résultats était un mélange des produits suivants : 2,4-DB, Bentazon, Sethoxydim, Assist et AmSO₄. Une application d'EPTC ou de Trifluralin dans le sol avant la plantation, suivie d'une application de 2,4-DB, a été plus efficace contre les mauvaises herbes à larges feuilles et les graminées indésirables que s'il n'y avait eu qu'une seule application.

INTRODUCTION: Recently a number of incentives have been offered to New Brunswick producers to expand alfalfa production in order to provide a higher degree of livestock feed self sufficiency. With these added incentives alfalfa acreage has been rapidly increasing and information on weed control technology is necessary.

Presently there are few registered products for alfalfa weed control. Establishment of seedling alfalfa in the planting year is very important in order to ensure stand longevity. Weed competition can reduce the alfalfa growth and stand so that plant entering dormancy in the fall are small and weak. This could then reduce yields the following year. With effective weed control in the establishment year, alfalfa can be given the chance to establish a strong, healthy dense stand which should outcompete many weeds that may try and establish themselves.

A trial was therefore established to evaluate both pre-plant incorporated (ppi) and post-emergence (POST) treatments applied either alone or in a split application (ppi followed by POST), on both broadleaf and grass weed control with minimal crop damage. Treatments included

both registered and non-registered products of which alfalfa has a reported tolerance.

MATERIALS AND METHODS: On May 21, 1988 alfalfa was planted in a trial at Anagance, Kings County. The seeding rate was 15.91 kg/ha. Fertilizer (5-10-30) was applied at 341 kg/ha. Experimental design was a randomized complete block replicated four times. Plot size was 2m x 6m. The previous crop was timothy. Pre-plant incorporated (PPI) herbicides (see table 1) were applied May 16 and incorporated in the soil using hand tillers. Post emergence (POST) herbicides (see table 1) were applied June 24. When the alfalfa was at the 3-4 trifoliate stage herbicides were applied using a CO2 backpack sprayer in a water volume of 250 L/ha at a pressure of 200 kPa. Rainfall was 3.8 mm five days before the ppi applications and 60.4 mm ten days after. Rainfall levels before Post applications was 28.6 mm five days prior and 38.2 mm ten days after. Visual assessment of crop phytotoxicity and weed control were taken June 29, July 8, July 22 and August 22. Weed density counts were taken August 3. Harvest was August 9. Logarithmic transformations were performed on yields and visual ratings and means separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

CROP DAMAGE AND WEED CONTROL - Treatments resulting in crop damage not significantly different from the untreated control plots by the first rating period June 29 (44 days after ppi; 5 days after POST treatments) included the ppi, trifluralin and EPTC treatments, the trifluralin and pyridate split timing treatment and the POST, pyridate treatment. Any of the treatments containing 2,4-DB, bromoxynil OR AC 263,499 displayed significant injury symptoms very rapidly. No significant differences in weed control existed at this time.

By July 8 (14 days after POST treatments) the only treatments with no significant crop damage were EPTC, trifluralin and pyridate. Evaluation of broadleaf and grass weed control at this time indicated that all treatments resulted in significant weed control as compared to the untreated control plots. Therefore the above three treatments would be the only products to provide significant weed control, without any significant crop damage. The two AC 263,499 treatments with Agral 90 were the most toxic to both the crop and broadleaf weeds. Best grass control was achieved with 2,4-DB + bentazon+ sethoxydim + Assist + AmS04; 2,4-DB + MCPA + Sethoxydim + Assist + AmS04 and the two AC263,499 rates. Products containing 2,4-DB all resulted in significant crop damage and broadleaf weed control, however, not

significantly different from one another. Eptc at this time provided significantly higher broadleaf weed control than trifluralin.

By July 22 (28 days after POST applications) all the treatments except the two AC 263,499 rates had now recovered and were not significantly different from the untreated control. This supports the statement in the 1988 guide to Chemical Weed Control, that 2,4-DB usually suppresses alfalfa growth for a period of two to three weeks.

At this date, all treatments resulted in significant broadleaf weed control. This indicated that all the treatments except the two AC 263,499 rates could be effectively applied to control broadleaf weeds without any significant crop damage. The best treatments although not significantly different from one another, were Eptc + 2,4-DB, 2,4-DB + bentazon + sethoxydim + Assist + AmSO₄, trifluralin + 2,4-DB, AC 263,499 + Agral 90 (0.15 kg(a.i.)/ha + 0.25% v/v) and 2,4-DB. the trifluralin and eptc treatments were not significantly different from one another at this time. Best grass control treatments were the same as the earlier ratings with the treatments containing sethoxydim and AC 263,499 being the most effective followed by trifluralin + 2,4-DB, Eptc + 2,4-DB and trifluralin + pyridate treatments. Pyridate and bromoxynil applied alone, and 2,4-DB + MCPA resulted in grass control not significantly different from the untreated control.

The results from the final rating period (Aug. 22, 59 days after POST applications) indicated that no differences in crop damage existed from any of the treatments (see table 1). Harvest had occurred 13 days previous and regrowth from all the treatments were excellent. Broadleaf weed control was significantly different from the untreated control for all the treatments applied. All treatments could therefore be applied and be expected to provide significant broadleaf weed control with no significant crop damage. The best treatments were trifluralin + 2,4-DB; 2,4-DB + bentazon + sethoxydim + Assist + AmSO₄; 2,4-DB; EPTC + 2,4-DB; 2,4-DB + MCPA; trifluralin + pyridate; 2,4-DB + MCPA + sethoxydim + Assist + AmSO₄; AC 263,499 + Agral 90 (0.15 kg (a.i.)/ha + 0.25% v/v. These treatments were, however, not significantly different from one another.

The only treatment not significantly different from the untreated plots when evaluating grass control was surprisingly the AC 263,499 low rate which had provided significant control up until this time. The best treatments which were also not significantly different from one another, in order of effectiveness were the two

treatments containing sethoxydim, AC 263,499 + Agral 90 (0.15 kg (a.i.)/ha + 25% v/v) etpc, etpc + 2,4-DB, trifluralin + 2,4-DB and trifluralin + pyridate. Etpc significantly controlled the grasses better than trifluralin applied alone.

Yield data indicated that no significant differences existed from any of the treatments. A closer look at botanical composition taken immediately before harvest (see Table II) however, gives a good indication of which treatments actually resulted in higher alfalfa and lower grass and broadleaf weed percentages. Generally the treatments with the highest alfalfa percentages also had the best weed control. Treatments resulting in the highest alfalfa percentage included 2,4-DB + bentazon + sethoxydim + Assist + AmSO₄; etpc + 2,4-DB; AC 263,499 (0.15 kg(a.i.)/ha; and etpc. Best overall weed control (% grass weed + % broadleaf weed) was achieved by 2,4-DB + bentazon + sethoxydim + Assist + AmSO₄ followed by EPTC + 2,4-DB, AC 263,499 0.15 kg (a.i.) ha + 0.25% v/v), etpc, and 2,4-DB + MCPA + sethoxydim + Assist + AmSO₄. These results mostly concur with visual ratings taken.

CONCLUSION: Although significant crop damage was observed soon after application from many of the products, the only treatments which displayed any significant symptoms of crop damage after one month were the two AC 263,499 treatments. However, no significant crop injury was observed on the alfalfa regrowth following the August 9 harvest from any of the treatments. Significant broadleaf weed control was observed from all treatments 14 days after the POST applications and continued throughout the evaluation dates. By the final evaluation date, significant grass control was observed from all treatments except AC 263,499 + Agral 90 (0.10 kg (a.i.)/ha + 0.25% v/v). These results indicate that significant weed control with no significant crop damage could be expected from the ppi treatments, 53 days after ppi applications and 59 days after the POST applications. It must also be remembered that the harvesting operation may have helped annual weed control at this time.

The treatment which provided the highest broadleaf and grass weed control and the highest actual alfalfa yields based on the percent alfalfa in the plots was the 2,4-DB + bentazon + sethoxydim + assist + AMSO₄ treatment. Other treatments which also provided significant and consistent overall weed control both visually and/or within the botanical composition included: 2,4-DB + mcpa + sethoxydim + assist + AmSO₄; trifluralin + 2,4-DB; Etpc + 2,4-DB; Etpc; and AC 263,499 + agral 90 (0.15 kg (a.i.)/ha + 0.25% v/v).

TABLE 1: VISUAL RATINGS OF CROP DAMAGE AND WEED CONTROL

Treatment	Rate kg(a.i.)/ha	Timing PPI-May 16 Post-May 21	VISUAL RATINGS - August 22			
			% Crop Damage	% Weed Control	% Grass Control	
Control	-	-	0 n.s.	0 f	0 g	
EPTC	4.5	PPI	0	12.5 e	47.5 abc	
EPTC; 2,4-DB	4.5; 1.4	PPI; POST	0	52.5 abc	47.5 abc	
Trifluralin	1.1	PPI	0	20.0 cde	20.0 ef	
Trifluralin; 2,4-DB	1.1; 1.4	PPI; POST	0	67.5 a	42.5 abcd	
Trifluralin; pyridate	1.1; 0.9	PPI; POST	0	40.0 abcd	45.0 abcde	
2,4-DB	1.4	POST	0	55.0 ab	35.0 bcdef	
2,4-DB + Bentazon + Sethoxydim +	0.5+0.56+ 0.5+	POST	0	67.5 a	72.5 ab	
Assist + AmSO4	2L+4L					
2,4-DB +	0.8 + 0.035	POST	0	32.5 abcde	85.0 a	
+ mcpa + sethoxydim	+ 0.5 + 2L					
+ Assist + AmSO4	+ 4L					
2,4-DB + MCPA	0.8+0.35	POST	0	50.0 abcd	30.0 bcdef	
AC 263,499 + Agral 90	0.10+0.25‡	POST	0	25.0 de	12.5 fg	
AC 263,499 + Agral 90	0.15+0.25‡	POST	0	35.0 abcde	65.0 ab	
Pyridate	0.9	POST	0	17.5 de	20.0 cdef	
Bromoxynil	0.3	POST	2.5	25.0 bcde	25.0 def	

Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's multiple range test.

TABLE II: YIELD AND BOTANICAL COMPOSITION

Treatment	Rate kg (a.i.)/ha	BOTANICAL COMPOSITION August 3, 1988			Yield August 9 T/ha
		% Alf.	% Grass	% BLW	
Control	-	63.5	7.5	29.0	11.35 n.s.
EPTC	4.5	89.4	0.7	9.9	9.42
EPTC: 2,4-DB	4.5;1.4	93.8	1.5	4.7	9.17
Trifluralin	1.1	80.0	8.2	11.8	11.03
Trifluralin; 2,4-DB	1.1;1.4	81.7	12.2	6.1	9.74
Trifluralin; pyridate	1.1;0.9	83.2	9.6	7.2	9.10
2,4-DB	1.4	71.1	20.1	8.8	10.38
2,4-DB + Bentazon + Sethoxydim +	0.5+0.56+ 0.5+	94.1	0	5.9	10.51
Assist + AmSO4	2L+4L				
2,4-DB + MCPA	0.8+0.035+	86.0	0.3	13.7	10.77
Sethoxydim +	0.5+				
Assist + AmSO4	2L+4L				
2,4-DB + MCPA	0.8+0.035	73.1	20.1	6.8	10.71
AC 263,499 + Agral 90	0.10+0.25‡	76.4	16.1	7.5	9.68
AC 263,499 + Agral 90	0.15+0.25‡	92.4	1.7	5.9	8.46
Pyridate	0.9	70.0	15.3	14.7	10.58
Bromoxynil	0.3	63.3	32.3	4.4	9.36

Means with the same letter are not significantly different at the 0.5 level of significance according to the Duncan's multiple range test.

Overall, broadleaf weed control was significantly improved when 2,4-DB was applied in the split application with ppi treatments of eptc or trifluralin as compared to when they were applied alone. When examining botanical composition, it can be observed that application of 2,4-DB to the ppi, eptc and trifluralin treatments did not increase grass control. This was expected as 2,4-DB is selective for broadleaf weed control and not grasses. Visual ratings surprisingly and unexplainably indicates that applications of 2,4-DB following trifluralin did significantly improve grass control.

Eptc was significantly better than trifluralin in controlling grasses but not significantly different in broadleaf weed control. Percentage alfalfa in the plots was also higher with the ppi treatments applied either alone or in association with 2,4-DB as compared to 2,4-DB alone. This would suggest that the grass weeds competing with the alfalfa in the first month and longer may be responsible for reduced yields. This would explain why the treatments containing sethoxydim, trifluralin, and eptc which all control grasses, had the highest alfalfa percentage within the plots.

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ALFALFA TOLERANCE WHEN PLANTED IMMEDIATELY OR THREE DAYS AFTER EPTC AND TRIFLURALIN APPLICATION

K.V. McCully, W. Brown, L. Cornish

ABSTRACT: A large scale non-replicated field trial was established to evaluate crop tolerance and weed control on alfalfa seeded immediately or three days following trifluralin or eptc application and incorporation. Alfalfa, broadleaf and grass weed densities, alfalfa height measurements and yields were collected. Results indicated that it may be safer to plant alfalfa 3 days after eptc application. Grass and broadleaf weed control results were not significantly different from the untreated control for any of the treatments. Results were variable, lacking any clear trends between the parameters evaluated. Rainfall levels around herbicide application may have been responsible.

TOLÉRANCE DE LA LUZERNE PLANTÉE IMMÉDIATEMENT OU TROIS JOURS APRÈS L'APPLICATION DU EPTC ET DU TRIFLURALIN

Résumé: Un essai en plein champ à grande échelle sur des parcelles non répétées a eu lieu pour évaluer la tolérance de la luzerne aux herbicides Trifluralin ou EPTC ainsi que l'efficacité de ces herbicides lorsque la luzerne est semée immédiatement après l'application ou l'incorporation des herbicides ou lorsque semée trois jours plus tard. On a recueilli des données sur les densités de luzerne, de mauvaises herbes à larges feuilles et de graminées indésirables, ainsi que sur la hauteur et le rendement de la luzerne. Les résultats indiquent qu'il serait plus sûr de planter la luzerne trois jours après l'application de l'EPTC. Les résultats de la suppression des graminées indésirables et des mauvaises herbes à larges feuilles ne varient pas de façon significative par rapport à la parcelle témoin non traitée. Les résultats ont été variables, et il n'est ressorti aucune tendance nette entre les paramètres évalués. Les niveaux de précipitations autour des périodes d'application sont peut-être la cause des résultats insatisfaisants.

INTRODUCTION: Alfalfa is often direct seeded without companion crops in order to favour strong establishment of forage plants. Weeds may, however, compete with the alfalfa crop during establishment and reduce yields. Research has indicated that crop yields are reduced far more by early weed competition than by the late season weed growth. Two products which are registered for direct seeded alfalfa are eptc (EPTAM), and Trifluralin (TREFLAN OR RIVAL). These herbicides are pre-plant incorporated (ppi) herbicides which must be applied to a well prepared seed bed before planting and incorporated as soon as possible. There are some reports that the length of time between the final herbicide incorporation and alfalfa seeding is important. A large scale non-replicated trial was therefore established to evaluate differences between eptc and trifluralin and determine if alfalfa can be planted immediately following final herbicide incorporation without any associated crop damage.

MATERIALS AND METHODS: The trial was established at Anagance, Kings Co. in a silt loam soil having a pH of 6.4. Apica alfalfa was planted either May 21 or May 23 depending upon the treatment, at a seeding rate of 16 kg/ha. 338 kg/ha of 5-10-30 fertilizer was applied.

Experimental design was a non-replicated completely randomized design. Plot size was 165 m x 20 m. Previous crop was hay. Herbicides were applied and incorporated May 21. Rainfall was 31.2 mm five days prior to application and 36.2 mm ten days after. Herbicide treatments were 1) trifluralin - alfalfa seeded immediately after application and incorporation (2) trifluralin - alfalfa seeded 3 days later, 3) eptc-alfalfa seeded immediately after application and incorporation, 4) eptc - alfalfa seeded 3 days later and 5) untreated control. Herbicides were applied and incorporated using the farmers equipment. Treatments were applied in water volumes of 250 l/ha. Count and measurement data were collected by randomly throwing a 1 m² quadrat 18 times throughout each plot. Yields were collected August 25 by harvesting a 167 m² strip, using the farmer's equipment. Logarithmic transformations were performed on the collected data and means separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION: To evaluate crop tolerance to alfalfa seeded immediately or three days after herbicide application and incorporation height measurements and alfalfa densities were randomly collected throughout all the plots. Although alfalfa seeded immediately following eptc application resulted in the shortest alfalfa height there was no significant height differences between any of the treatments (see Table 1). Examination of alfalfa densities indicated that alfalfa planted 3 days after eptc application resulted in densities significantly higher than the other treatments and the control (see Table 1). Alfalfa planted 3 days after trifluralin application resulted in the lowest alfalfa densities, but were not significantly different from the untreated control. There did not appear to be any relationship between the alfalfa densities and height measurements at this time.

Broadleaf and grass density counts were also collected to evaluate weed control. There was no significant broadleaf weed control from any of the treatments as compared to the control, indicating these products weaknesses on broadleaf weeds (see Table 1). None of the treatments resulted in significant grass control and the only treatment which had lower densities than the untreated control was the plot where alfalfa was seeded immediately following trifluralin application.

Yields included both weeds and alfalfa so plots with the poorest weed control could still have high total yields. The percentage of alfalfa would be much lower however. Highest yields were obtained from alfalfa planted 3 days after trifluralin application, followed by yields from the untreated control (see Table 1). It is probable

TABLE 1: DENSITIES, YIELDS AND ALFALFA HEIGHT FOR ALFALFA PLANTED IMMEDIATELY AND 3 DAYS AFTER EPTC OR TRIFLURALIN APPLICATION

Treatment	Rate (kg (a.i.)/ha)	Alfalfa Planted	Alfalfa Height	DENSITIES (m ⁻²)		Yields Aug. 25 (T/ha)
				Alfalfa	BLW	
Control	-	May 21	45.6 n.s.	35.3 bc	10.0 n.s.	6.4 bc
Trifluralin	1.1	May 21	43.9	35.9 bc	9.3	3.9 c
Trifluralin	1.1	May 24	44.6	27.9 c	8.6	12.1 a
EPTC	3.4	May 21	39.0	39.2 b	12.0	10.9 ab
EPTC	3.4	May 24	43.6	59.0 a	9.6	8.3 abc
						8.14
						5.97
						8.68
						6.51
						7.05

n.s. represents not significant
BLW - broadleaf weeds

Means with the same letter are not significantly different at the 0.5 level of significance according to Duncan's multiple range test.

however, that the trifluralin treatment where alfalfa was planted 3 days later had a high weed percentage in its yields, as it had the lowest alfalfa density of all treatments and the poorest grass control. Lowest yields resulted from the alfalfa planted immediately after trifluralin application. Yields were expected to be higher here since it had the best overall weed control with no apparent crop damage.

CONCLUSIONS: There did not appear to be any clear trends between crop injury, broadleaf weed control, grass control, and yields from the treatments. Alfalfa planted immediately following eptc application resulted in decreased alfalfa height, although not significantly lower than the other treatments, fewer alfalfa plants and poorer broadleaf and grass weed control than when planted 3 days after eptc application. It appears that less damage, although not necessarily significant, can be expected by waiting 3 days after eptc application.

Overall broadleaf and grass control was poor from all treatments with no resulting significant increases in weed control. It is possible that rainfall which had occurred before application (28.0 mm - 3 days before) may have been responsible for the poor weed control and variable results. Both products prefer a warm, dry soil for optimal results.

Results from trifluralin were variable but it appears that there is no advantage in delaying alfalfa planting following its application. Due to variability, lack of any definite trends and poor weed control, it is difficult to compare treatments and make any safe definite conclusions.

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CROP HERBICIDE TOLERANCE AND WEED CONTROL IN MAX MILLING WHEAT UNDERSEEDED TO RED CLOVER

K.V. McCully, S.J. LeBlanc and D.O. Hanscomb

ABSTRACT: Herbicides were applied to max milling wheat underseeded to Red clover, to evaluate their effectiveness in controlling weeds with minimal crop damage. Both currently recommended registered products and non registered products were applied June 6, 1988 when the wheat was at the 2-3 leaf stage and clover at its first trifoliate. Results indicated that the Pyridate and MCPA treatments were visually the least phytotoxic to the red clover while clover yields indicated no significant differences amongst treatments. No significant differences existed in wheat visual damage on yields or in weed control.

TOLÉRANCE DES CULTURES AUX HERBICIDES ET ÉLIMINATION DES MAUVAISES HERBES DANS LE BLÉ DE MEUNERIE MAX EN CULTURE ASSOCIÉE AU TRÈFLE ROUGE

RÉSUMÉ Des herbicides ont été appliqués au blé de meunerie Max cultivé en association avec du trèfle rouge afin d'évaluer la mesure dans laquelle ils supprimaient les mauvaises herbes tout en causant le moins de dommages aux cultures. Le 6 juin 1988, on a procédé à l'application de produits homologués et de produits non homologués qui faisaient l'objet de recommandation, au moment où le blé était à l'étape de 2 à 3 feuilles et où le trèfle en était à son premier stade trifolié. L'inspection visuelle a indiqué que le Pyridate et le MCPA étaient les produits les moins phytotoxiques pour le trèfle rouge, et le rendement de cette culture ne variait pas sensiblement d'un traitement à l'autre. L'observation visuelle du blé n'a pas révélé de grands écarts dans les rendements ou dans le taux de suppression des mauvaises herbes.

INTRODUCTION: A common practice in New Brunswick is to underseed forages to cereal crops. This is often done for rotation purposes or to provide a nutritional livestock feed. This practice, however, limits the number of herbicides which may be safely applied to the mixture. MCPA has been frequently applied to underseeded clovers in New Brunswick but has often resulted in inconsistent and unacceptable clover damage. MCPA has a "narrow window" for herbicide application without clover damage. This trial was conducted to evaluate other registered and non-registered products for effective weed control with minimal crop damage.

MATERIALS AND METHODS: The experiment was conducted at Centerville, Carleton county. Max spring wheat was planted May 11, 1988 at 136 kg/ha and underseeded to red clover at 13.64 kg/ha. The soil was a silt loam soil having a pH of 5.7 and an organic matter level of 4.48%. 312 kg/ha of 34-0-0 fertilizer was also applied. Experimental design was a randomized complete block design with four replicates. Plot size was 2m x 6m. Previous crop was potatoes. Herbicides (see table 1) were applied June 9 when the wheat was at the 2-3 leaf stage and the clover at one trifoliate. A CO2 backpack sprayer was used applying a water volume of 200 L/ha at a pressure of 200 kPa. Rainfall was 0 mm five days prior to application and 24 mm ten days after. Visual

assessments of crop phytotoxicity and weed control were taken June 22, July 12 and August 11. Harvest for the wheat was August 23 while the red clover was harvested October 12. A HEGE 125B combine was used to harvest the wheat while a Rem harvester was used to harvest a 65 cm strip of red clover from the center of each plot. Logarithmic transformations were performed on the visual evaluations and yields while the means were separated using Duncan's multiple range test.

RESULTS:

A) Red Clover - crop damage

Pyridate applied at 1.0 and 1.5 kg (a.i)/ha were the only treatments not displaying injury symptoms significantly different from the control throughout the entire season. MCPA amine and Na salt formulations had recovered by mid-season from initial injury and were not significantly different from the control by the August 23 harvest date (see Table 1). The MCPA treatments (MCPA amine, MCPA Na and MCPB/MCPA) treatments were not significantly different from each other by the end of the season. 2,4-D and 2,4-DB were more phytotoxic than the MCPA treatments, although not always significantly throughout the season. Pff 901 was consistently the most phytotoxic treatment throughout the season, followed by the remaining Pff products, bromoxynil/MCPA and the bromoxynil treatment. Although Red clover yields varied from treatment to treatment, they were not significantly different from one another by the Oct. 12 harvest date.

B) Max Wheat - Crop Damage and Yields

There was no significant crop damage observed from any of the treatments throughout the summer. Yields, although varying from treatment to treatment were not significantly different from one another or the untreated control plot.

C) Weed Control

No significant differences existed in weed control ratings for any of the treatments throughout the summer. It is crucial to note, however, that there were very few weeds present in any of the plots prior to treatment.

DISCUSSION AND CONCLUSION: Evaluation of red clover visual damage at the first rating indicated that Pyridate was the only treatment not significantly different from the untreated control. By the final rating, MCPA amine, MCPA Na and Pyridate were the only treatments not significantly different from the control (see Table 1). The 2,4-D and 2,4-DB treatments were more phytotoxic than the MCPA products throughout the summer but not always

TABLE 1: YIELDS AND VISUAL RATINGS ON CROP DAMAGE AND WEED CONTROL

Treatment	Rate kg(a.i.)/ha	Visual Ratings August 11, 1988 % clover Damage	Wheat Yields Aug. 23 T/ha	Red Clover Yields Oct. 12 T/ha
Control	-	0.0 f	90.0 n.s.	1.00 n.s.
MCPA NA 300	0.42	0.0 f	96.3	0.95
MCPA amine	0.42	5.0 def	96.3	0.92
2,4-D	0.42	15.0 bc	90.0	0.89
2,4-DB	1.40	17.5 bcd	96.3	0.89
MCPB/MCPA	1.70	7.5 cde	96.3	0.77
Pyridate	1.00	0.0 f	93.8	0.77
Pyridate	1.50	2.5 ef	96.3	0.76
Pff 881	1.10	25.0 b	93.8	0.76
Pff 881	1.40	25.0 b	92.5	0.76
Pff 910	0.85	22.5 b	96.3	0.75
Pff 901	1.10	61.3 a	95.0	0.70
Pff 910	0.65	25.0 b	95.0	0.67
Bromoxynil	0.28	27.5 b	92.5	0.57
Bromoxynil/MCPA	0.56	27.5 b	95.0	0.46

Means followed by the same letter are not significantly different at the 0.05 level of significance according to the Duncan's multiple range test.

Note: Initial weed population in plots was minimal. No damage was observed on wheat.

significantly. Although visual red clover damage occurred no significant differences existed by harvest. This indicated that there was good recovery from all treatments by the Oct. 10 harvest date, and by the following year, it is unlikely that red clover damage would be detectable from any of the treatments. The Pff and bromoxynil products injured the clovers most notably and significantly. There was no damage to the wheat visually or in yield reduction. Weed control was excellent with all treatments, but is difficult to assess since there were very few weeds initially present.

It appears from the results that Pyridate is the safest product to use on underseeded red clover, however, it is not registered. The safest registered products were the MCPA amine and Na formulations, but when applied alone it is important to realize the necessity of proper timing. The cereal crop must be developed at least to the 3 leaf stage so that the cereal leaves protect the clover from some of the herbicide.

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WILD OAT CONTROL IN BARLEY

K.V. McCully, M. Boulanger, S.J. LeBlanc and D.O. Hanscomb

ABSTRACT: A trial to evaluate various herbicides and mixtures for their effectiveness in controlling wild oats and broadleaf weeds was established. Visual ratings on crop damage, wild oats and broadleaf weed control were collected along with wild oat density counts and barley yields. Results indicated that visually all treatments provided significant wild oat and broadleaf weed control throughout the entire season with no significant crop damage after 27 days. Wild oat density data, however, indicated that only six treatments had wild oat densities significantly lower than the untreated control. The most effective treatment for reducing these densities was ICIA 0604 + superior oil concentrate. To achieve high yields, however, it was found that a broadleaf weed herbicide had to be mixed in with the wild oat herbicide. The highest yielding treatments, difenzoquat + bromoxynil/MCPA and ICIA 0604 + bromoxynil/MCPA had the highest combined wild oat and broadleaf weed control and would therefore be the most desirable treatments.

RÉPRESSION DE LA FOLLE AVOINE DANS L'ORGE

Résumé: Un essai a permis d'évaluer l'efficacité de divers herbicides et mélanges pour la suppression de la folle avoine et des mauvaises herbes à larges feuilles. On a recueilli des données sur les dommages causés à la récolte, sur la suppression de la folle avoine et des mauvaises herbes à larges feuilles, ainsi que sur la densité de la folle avoine et le rendement de l'orge. L'observation visuelle indiquait que tous les traitements avaient obtenu de bons résultats pour la suppression de la folle avoine et des mauvaises herbes à larges feuilles tout au long de la saison, sans avoir endommagé considérablement la récolte 27 jours après l'application. Les données recueillies sur la densité de la folle avoine indiquaient cependant que seuls six traitements avaient réduit de façon significative les densités de folle avoine par rapport aux parcelles témoins non traitées. Le traitement le plus efficace pour réduire la densité était le produit ICIA 0604 accompagné d'un concentré d'huile de qualité supérieure. Toutefois, pour obtenir des rendements élevés, on a découvert qu'il fallait mélanger un herbicide pour mauvaises herbes à larges feuilles à un herbicide pour folle avoine. Les produits qui ont donné un rendement supérieur sont une combinaison de Difenzoquat et de Bromoxynil/MCPA et une combinaison de ICIA 0604 et de Bromoxynil/MCPA. Ces produits avaient également donné les meilleurs résultats pour la suppression combinée de la folle avoine et des mauvaises herbes à larges feuilles et il serait, par conséquent, souhaitable de les utiliser.

INTRODUCTION: Wild oats has become a serious problem in the St. Quentin area of the province and if permitted to survive will become an even worse threat here and to the remainder of the province. It is presently considered the most common and troublesome weed in Western Canada (Banting, 1980). Percentage losses in barley yields is related to the number of wild oats per m^2 . Ten plants per m^2 can cause yield reductions of 7.3%, 53 per m^2 = 16.3%, and 215 m^2 a 232.7% yield reduction (Friesen, 1973). Losses from wild oats include yield reduction, dockage, cleaning costs and lowering of grade and quality. Poor broadleaf weed control can further reduce these yields.

A trial was therefore established to evaluate various registered and non-registered products applied either alone or in a tank mix with a broadleaf weed herbicide for their effectiveness in controlling wild oats and broadleaf weeds with no associated crop damage.

MATERIALS AND METHODS: Leger barley was planted May 6, 1988 in a silt loam soil at St. Quentin, Restigouche County. The soil had a pH of 6.5 and an organic matter level of 5.47%. The seeding rate was 136 kg/ha with a row width of 18 cm. Experimental design was randomized complete block with four replicates. Various post emergence (POST) herbicides were applied June 9, 1988. (Refer to table 1 for herbicide treatments and rates.) Herbicides were applied with a CO₂ backpack sprayer in a water volume of 150 L/ha at a pressure of 200 kPa. Rainfall was 1 mm five days prior to application and 8.6 mm ten days after. A total of 340 kg/ha of 17-17-17 fertilizer was applied to the plots. Visual ratings on weed control and crop phytotoxicity were taken June 23, July 6, August 4 and August 26. Density counts using a 50 cm² quadrat were taken August 24. Two counts were made on each plot. Harvest occurred August 29 by taking one metre samples from each plot. Logarithmic transformations were performed on the yield and visual ratings, and means separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

Crop Damage:

Significant crop damage was initially seen within the first two weeks following treatment application from HOE 33171, AC 222,293, diclofop methyl and AC 222,293 + bromoxynil/MCPA treatments. All remaining treatments were not significantly different from the untreated control. By July 6 (27 days after application) all damage had recovered to levels not significantly different from the untreated controls.

Wild Oat Control

All treatments significantly controlled wild oats as compared to the untreated control for all the assessment dates (14 days to 78 days after application) when visually evaluating the wild oat control (see Table 1). Fastest reacting treatments included all the treatments containing ICIA 0604 and the diclofop methyl + bromoxynil treatment. Slowest reacting treatments were HOE 33171 and AC 222, 293 whether applied alone or in a tank mix with bromoxynil/MCPA.

ICIA 0604 + Superior oil concentrate (S.O.C.) was the most effective treatment in controlling wild oats according to visual data. Difenzoquat + bromoxynil/MCPA also provided excellent wild oat control. Treatments

consistently providing poor wild oat control, although still significantly different from the untreated plots were ICIA 0604 + MCPA, HOE 33171 + bromoxynil/MCPA and HOE 33171.

Analysis of wild oat density data indicated that six treatments significantly lowered wild oat densities as compared to the untreated control (see table 1). The most effective treatment was ICIA 0604 + S.O.C (1.0 plant m^{-2}), followed by difenzoquat and difenzoquat + bromoxynil/MCPA (7.0), diclofop methyl + bromoxynil (16.5), ICIA 0604 + bromoxynil/MCPA (20.5) and diclofop methyl (39.0). However, these treatments were not significantly different from one another. The visual rating data also found these treatments to be the most effective, although not necessarily in the same order as above.

Broadleaf weed control was significantly different from the control for all treatments at all assessment dates. The most effective treatments were the mixtures containing bromoxynil or MCPA applied either alone or in combination with each other (see Table 1). This was expected as they were added to the mixtures for their known selectivity to many broadleaf weeds. Although treatments without selectivity for broadleaf weeds had the poorest broadleaf weed control, they were still significantly different from the control. It is possible that the high wild oat densities may have outcompeted some of the broadleaf weeds and lowered their density.

Crop Yields

Lowest yields recorded were from the untreated control plots due to increased weed-crop competition (see Table 1). Highest barley yields would be expected from treatments providing the highest wild oat and broadleaf weed control with the least crop damage.

Treatments with yields not significantly different from the untreated control included ICIA 0604 + MCPA, AC 222,293 and HOE 33171. These treatments did not control wild oats and/or broadleaf weeds to acceptable levels, thereby reducing yields.

The highest yielding treatments were difenzoquat + bromoxynil/MCPA and ICIA 0604 + bromoxynil/MCPA. These treatments also had the highest combined wild oat and broadleaf weed control.

CONCLUSIONS:

TABLE 1: DENSITIES, YIELDS AND VISUAL RATINGS

Treatment	Rate kg(a.i.)/ha	Visual Ratings August 26, 1988		% BLW Control	Wild Oats Density (m^{-2}) August 24	Yields August 29 t/ha
		% Crop Damage	% W.O. Control			
Control	-	0.0W.S.	0.0 g	0.0 d	199.0 a	0.79 b
ICIA 0604 + Sup. oil Conc.	0.25	0.0	80.0 a	18.8 c	1.0 e	2.42 a
ICIA 0604 + MCPA	1.0% v/v					
	0.25	3.7	23.8 ef	70.0 a	158.0 ab	1.47 ab
	0.56					
ICIA 0604 + Bromoxynil/MCPA	0.25	0.0	61.3 abc	55.0 ab	20.5 cde	2.76 a
	0.56					
AC 222 293	0.50	12.5	37.5 cdef	31.3 bc	49.0 abcd	1.81 ab
AC 222 293 + Bromoxynil/MCPA	0.50	1.2	47.5 bcde	58.8 ab	133.0 ab	2.11 a
	0.56					
Hoe 33171	0.08	1.2	31.3 def	18.8 c	77.0 abcd	1.48 ab
Hoe 33171 + Bromoxynil/MCPA	0.08	1.2	26.3 ef	50.0 ab	93.5 abc	2.47 a
	0.56					
Diclofop methyl + Bromoxynil	0.70	7.5	58.8 abc	16.3 c	39.0 bcd	1.86 a
Diclofop methyl + Bromoxynil	0.28	0.0	53.8 abcd	20.0 c	16.5 cde	2.56 a
Difenzoquat	0.75	0.0	52.5 abcd	20.0 c	7.0 de	1.93 a
Difenzoquat + Bromoxynil/MCPA	0.75	0.0	70.0 ab	58.8 ab	7.0 de	2.0 a
	0.56					

Means with the same letter are not significantly different at the 0.05 level of significance according to the Duncan's multiple range test.

Within 27 days of treatment application any crop injury initially observed had recovered to non-significant levels. Examination of visual data indicated that all treatments significantly controlled wild oats and broadleaf weeds for the duration of the season. All treatments were therefore effective in controlling wild oats although at different levels.

The most effective treatment for controlling wild oats was ICIA 0604 + Superior Oil Concentrate (S.O.C.). Density data indicated that its effectiveness was reduced slightly, but not significantly when mixed with bromoxynil/MCPA. Mixture with MCPA only, however, significantly reduced control to levels not significant from the untreated control and therefore appear to be antagonistic. Broadleaf control was, however, increased with the addition of these products.

Treatments with the highest combined percentage wild oat and broadleaf weed control and lowest wild oat densities generally had the highest yields. This was true with the two highest yielding treatments of difenzoquat + bromoxynil/MCPA and ICIA 0604 + bromoxynil/MCPA. All treatments except ICIA 0604 + MCPA, AC 222,293 and HOE 33171 resulted in significant yield increases. These treatments had either ineffective wild oat and/or broadleaf weed control, or some associated crop damage.

The addition of bromoxynil/MCPA to AC 222,293, HOE 33171, and difenzoquat, and bromoxynil to diclofop-methyl all increased broadleaf weed control and yields. Yield differences however, were not significantly different from the treatments without these broadleaf herbicides added.

AC 222,293, although known to control some broadleaf weeds, was more effective in controlling broadleaf weeds and reducing barley damage when bromoxynil/MCPA was applied. Difenzoquat applied either alone or in a tank mix with bromoxynil/MCPA was slightly better than diclofop methyl treatments applied either alone or in a tank mix with bromoxynil, when comparing wild oat control, broad leaf control, and yields. Differences however were not significant.

ACKNOWLEDGEMENTS: Appreciation is expressed to Roland Durette for providing land for this trial.

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FUNGICIDE CONTROL OF LEAF AND EAR DISEASES IN KATEPWA SPRING WHEAT

K.V. Lynch and D.F. Walker

ABSTRACT: The most effective treatment was a split application of Tilt on July 5th and 20th which increased yield 720 kg/ha compared to the untreated. Other treatments which increased yields more than 500 kg/ha were a split application of Folicure, a single application of Tilt on June 28th and a split application of Tilt plus Bravo.

EMPLOI DE FONGICIDES SUR LE BLÉ DE PRINTEMPS KATEPWA POUR LUTTER CONTRE LES MALADIES DES FEUILLES ET DES ÉPIS

Résumé: Le traitement le plus efficace a été l'application du fongicide Tilt en deux temps, soit les 5 et 20 juillet; le blé traité a produit 720 kg de grain de plus à l'hectare que le blé non traité. On a obtenu un accroissement de rendement de plus de 500 kg à l'hectare avec une application de Folicure en deux temps, une application simple de Tilt le 28 juin et une application combinée de Tilt et de Bravo.

MATERIALS AND METHODS: Katepwa spring wheat was planted on May 10 in plots measuring 2 m X 8.5 m arranged in a four replicate randomized block design. Fungicides and rates: Bravo 1850 g ai/ha or when tank mixed 1235 g ai/ha, Folicure 125 g ai/ha, Tilt 125 g ai/ha, Bayleton 125 g ai/ha and Dithane M45 1800 g ai/ha. Sprays were applied on June 28, July 5, 13, 20. Twenty-five penultimate leaves per plot were collected on July 12 and July 20 and rated for disease. Ears (20 per plot) were collected on August 10 and similarly rated. Plots were harvested on August 19 and yield and 1000 kernel weight determined.

RESULTS AND DISCUSSION: Powdery mildew developed early and extensively on Katepwa affecting 12 percent of the fourth leaf (from top) by July 4 and 12 percent of the second leaf by July 11 at which time Septoria could also be detected on the second and third leaf. Plots which received either Bayleton, Tilt or Folicure had excellent mildew suppression on the first and second leaf. Septoria suppression however was poor and the leaves collected on July 12 had no significant difference between treatments. Disease ratings on July 20 are given in Table 1 and although significant differences were found, the overall disease suppression was poor compared to the untreated. However, for ears collected on August 10 the control of disease on the glumes was excellent for those treatments receiving either a Tilt or Folicure application and good for those receiving either Bayleton or Bravo.

In terms of yield, the treatment of two Tilt applications on July 5 and 20 was best increasing yield by 720 kg/ha compared to the untreated. Other treatments giving yield increases greater than 500 kg/ha were Folicure, a single application of Tilt (June 28) and a split application of Tilt plus Bravo.

CONCLUSION: The susceptibility of Katepwa to powdery mildew will make disease management of this variety different from Max. Fungicides selected will have to have activity against this disease

and timing of applications will undoubtedly be earlier in the season. Monitoring of the crop for the presence of mildew at growth stage 30 should be carried out.

TABLE 1: FUNGICIDE CONTROL OF LEAF AND GLUME DISEASES IN KATEPWA SPRING WHEAT

Treatment	Spray Date	% Disease 2nd leaf	% Disease Glumes	Yield T/ha	TKW grams
Untreated		67.8 ab*	72.5 a	2.23 f	31.1 e
Tilt	6-28	71.0 a	6.7 f	2.78 abc	33.7 cd
Tilt	7-5	60.8 cd	11.6 e	2.43 def	33.7 cd
Tilt + Tilt	7-5,20	66.2 abc	11.1 e	2.95 a	35.3 ab
Tilt + Tilt/ Bravo	7-5,20	61.5 bcd	11.5 e	2.60 bcde	35.2 ab
Tilt + Bravo	7-5,20	52.2 fg	11.4 e	2.73 abcd	36.2 a
Tilt + Mancozeb	7-5,20	61.0 bcd	10.7 e	2.53 cde	35.5 ab
Folicure + Folicure	7-5,20	50.8 g	11.2 e	2.88 ab	35.1 abc
Bravo + Bravo	7-5,20	46.2 g	28.2 d	2.33 ef	32.9 d
Mancozeb + Mancozeb	7-5,20	52.8 efg	54.2 b	2.53 cde	33.6 d
Mancozeb + Mancozeb + Mancozeb	7-5,13, 20	59.5 cde	41.2 c	2.55 cde	34.2 bcd
Bayleton	7-5	64.0 bcd	27.0 d	2.65 bcd	33.3 d
Bayleton + Bravo	7-5, 20	57.5 def	22.9 d	2.58 cde	33.0 d

*DMR .05

FUNGICIDE CONTROL OF SEPTORIA LEAF AND GLUME BLOTCH IN MAX SPRING WHEAT

K.V. Lynch and D.F. Walker

ABSTRACT: A treatment of Folicure on 13 July and 29 July was the only treatment to significantly increase both yields and thousand kernel weight compared to the untreated. This yield increase of 500 kg/ha is related to good disease suppression of leaf and glume diseases. Treatments later than July 5 were relatively ineffective at controlling Septoria leaf disease with the exception of Folicure.

UTILISATION DE FONGICIDES POUR LUTTER CONTRE LA SEPTORIOSE ET LES TACHES DE GLUME SUR LE BLÉ DE PRINTEMPS MAX

Résumé: Le Folicure appliqué les 13 et 29 juillet est le seul traitement qui a permis d'augmenter le rendement moyen et le poids de mille grains de blé par rapport au blé des parcelles non traitées. L'accroissement du rendement de 500 kg/ha est attribuable à la suppression d'une bonne partie des maladies des feuilles et des glumes. À l'exception du Folicure, les traitements contre la septoriose appliqués après le 5 juillet ont été relativement inefficaces.

MATERIALS AND METHODS: Max spring wheat was planted on May 10 in plots measuring 2 m X 8.5 m arranged in a four replicate randomized block design. Fungicides and rates were: Bravo 1850 g ai/ha or when tank mixed 1235 g ai/ha, Folicure 125 g ai/ha, Tilt 125 g ai/ha, and Dithane M45 1800 g ai/ha. Sprays were applied on June 28, July 5, 13, 20, 29 and August 5. Twenty-five penultimate leaves per plot were collected on July 27 and rated for Septoria and 20 ears per plot were collected on August 10 and similarly rated. Plots were harvested on August 19 and yield and 1000 kernel weight determined.

RESULTS AND DISCUSSION: Disease development was similar in 1988 to past years. Septoria symptoms were not prevalent until July 11 (G.S. 69) at which time 25 percent of the fourth leaf (from top) was affected. By July 18 (G.S. 75), the percentage disease was, fourth leaf 87, third leaf 25, second leaf 12, flag 3 and ear 3. Fusarium head blight was first noted on July 25 (G.S. 78) and Septoria ratings on that date were, third leaf 100, second leaf 93, flag 25 and ear 12 percent. Leaves were 100 percent affected on August 4 and 10 and Septoria ratings for ears were 50 and 75 percent respectively.

Disease management depends on both the choice of fungicide and the correct timing of application. Little can be learned about the efficacy of the various fungicides from this year's work as it is obvious from the data that spray date was the deciding factor. All treatments applied on July 13 (G.S. 70) or later gave significantly less control of leaf disease than Tilt applied on either June 28 (G.S. 50) or July 5 (G.S. 55).

Since many of these treatments consisted of Tilt and/or other fungicides such as Bravo or Folicure which from previous work are known to give good disease suppression, it's clear that the application dates later than July 5 were too late for effective leaf disease control. Lynch and Walker 1987, found that fungicides applied before growth stage 39 were less effective at disease suppression than those applied at G.S. 39 or 59. This is supported by work in 1986 which gave excellent disease control from a single application of Tilt at G.S. 41 (Lynch and Walker, 1986). It appears that good suppression of Septoria on the leaf can be achieved with a single application of Tilt between growth stages 39 and 55. Growers should monitor their crop in the boot or just as the heads start to emerge.

This early application of Tilt does not supply adequate disease suppression of glume blotch as is evident from table one. However, Bravo has performed well in this aspect and should it become registered, a follow-up application about two weeks after the Tilt application may be warranted depending on the current value of grain.

In terms of yield, the Folicure plus Folicure treatment was the only one significantly greater than the untreated and also the only one to have a significantly higher thousand kernal weight. With this treatment the disease control on the second leaf was similar to those treatments receiving an early Tilt application; however, with Folicure the control of glume blotch was superior and it is this that probably accounts for the higher yield and thousand kernal weight. The Bravo plus Bravo treatment gave similar glume blotch control but significantly less leaf disease control probably because the first application date was too late.

REFERENCES: 1. Lynch, K.V. and Walker, D.F., 1986. Evaluation of Fungicides for Control of Foliar Diseases of Spring Wheat. Adaptive Research Report 1986. Plant Industry Branch, New Brunswick Department of Agriculture.

2. Lynch, K.V. and Walker, D.F., 1987. Fungicide Control of Septoria Leaf and Glume Blotch in Max Spring Wheat. Adaptive Research Report 1987, Plant Industry Branch, New Brunswick Department of Agriculture.

**TABLE 1: FUNGICIDE CONTROL OF SEPTORIA LEAF AND GLUME
BLOTCH IN MAX SPRING WHEAT**

Treatment	Spray Date	% Disease 2nd Leaf	% Glume Blotch	Yield T/ha	TKW Grams
Untreated	-	92.8 a*	70.0 a	2.73 b	31.9 bc
Tilt	6-28	20.6 fg	65.0 ab	2.88 ab	33.0 bc
Tilt	7-5	15.2 g	59.8 bc	3.00 ab	32.6 bc
Tilt	7-13	69.0 cd	60.2 bc	2.85 ab	32.6 bc
Tilt + Tilt	7-13,29	50.0 de	57.0 c	2.98 ab	31.6 c
Tilt + Tilt/Bravo	7-13,29	62.8 cd	60.8 bc	3.03 ab	32.2 bc
Tilt + Bravo	7-13,29	66.5 cd	61.2 bc	3.05 ab	32.9 bc
Tilt + Mancozeb	7-13,29	61.8 cd	63.2 b	2.95 ab	33.9 ab
Folicure + Folicure	7-13,29	36.2 ef	44.8 d	3.23 a	35.1 a
Bravo + Bravo	7-13,20	83.6 b	43.2 d	3.03 ab	33.7 ab
Mancozeb + Mancozeb	7-13,20	83.8 b	60.8 bc	3.05 ab	32.4 bc
+ Mancozeb	29	84.2 b	59.5 bc	2.80 ab	32.6 bc
Mancozeb + Mancozeb	7-13,20,				
+ Mancozeb + Mancozeb	29,8-5	79.4 bc	59.8 bc	2.73 ab	31.9 bc

*DNR .05

THE 1988 GROWING SEASON

George S. Read

ABSTRACT: The growing season for 1988 in New Brunswick was characterized by, a dry spring and early summer with slightly above normal temperatures, followed by a wet August and a cool September.

SAISON DE CROISSANCE 1988

Résumé: Au Nouveau-Brunswick, la saison de croissance 1988 a été marquée par un printemps sec, un été précoce et des températures un peu supérieures à la normale; le mois d'août était humide, et septembre a été frais.

INTRODUCTION: Generalizing the weather conditions for and entire province for an entire season does not explain crop performance on individual farms or even separate regions for the most part. The climate of farms varies significantly from one location to another with such things as frost occurrence, crop development, planting, insect and disease development or harvesting operations. It is therefore necessary to evaluate specific varieties, recommendations and production practices with the most localized or representative information as possible.

Despite these farm scale influences, the overall performance of crops on a provincial scale can often be correlated with major deviations from normal growing season conditions, such as droughts, wet periods, extensive frosts or unusually warm or cold seasons. With these factors recognized, a general summary of the 1988 cropping season weather is presented.

DISCUSSION: The accompanying maps describe the percent deviation of precipitation and temperature from a long term average as interpreted from data collected at Environment Canada climate stations. The precipitation maps were drawn courtesy of the New Brunswick Department of Munciple Affairs and Environment.

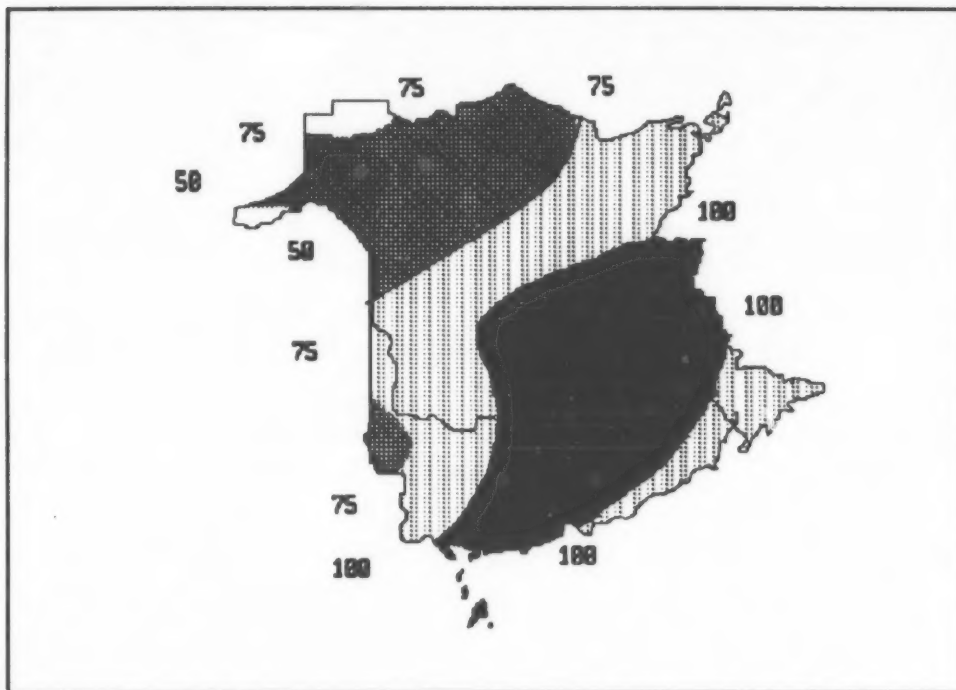


Figure 1. Total precipitation percent of normal, May 1988.

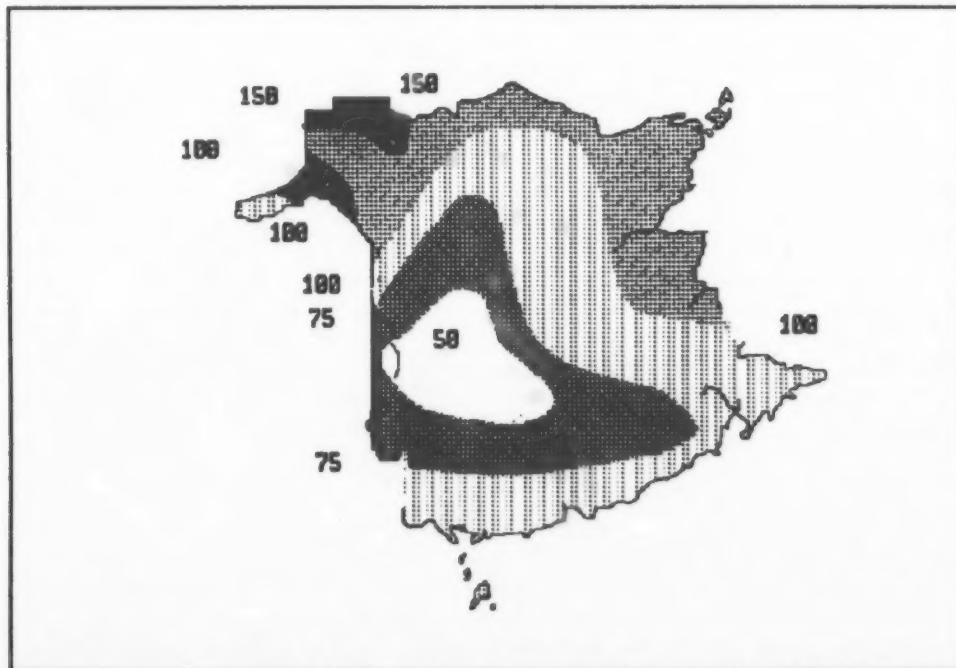


Figure 2. Total precipitation percent of Normal June, 1988.

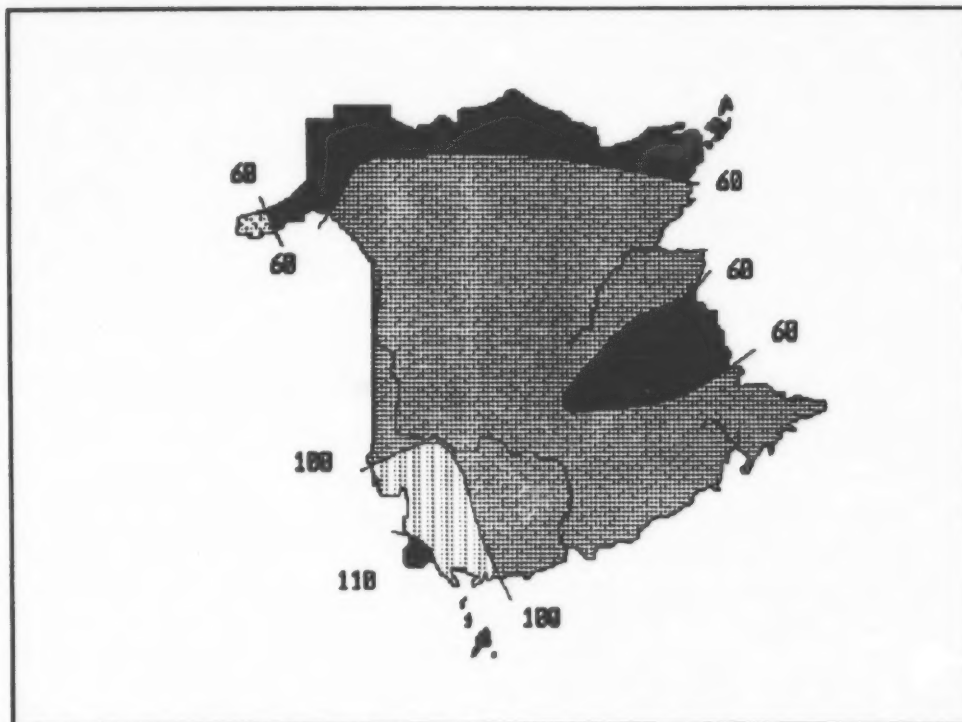


Figure 3. Total precipitation as a percent of normal for July, 1988.

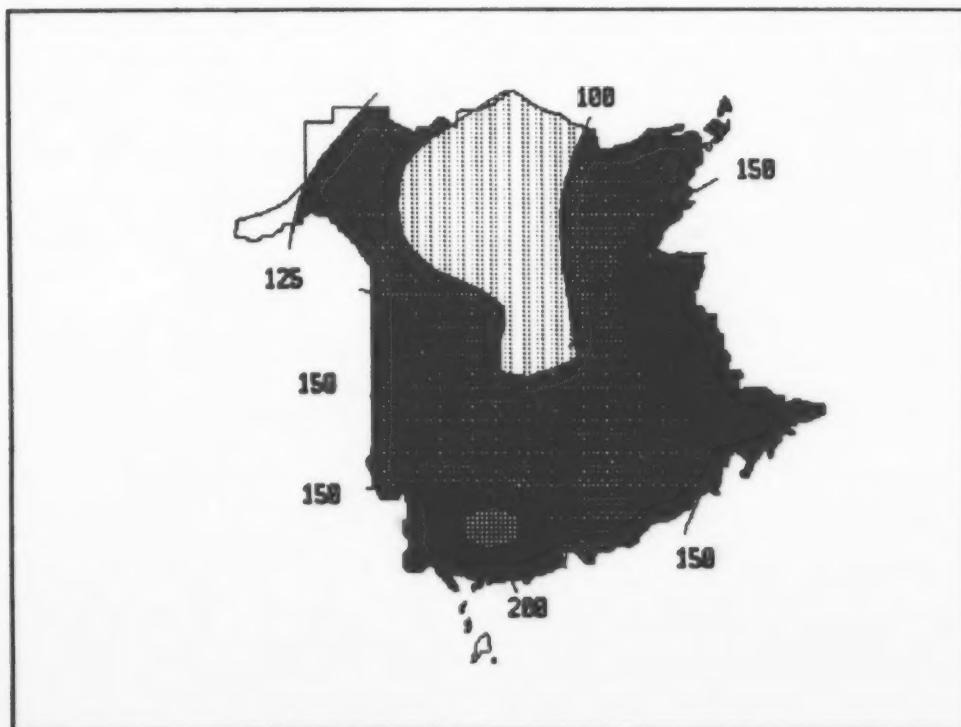


Figure 4. Total precipitation as a percent of normal for August, 1988.

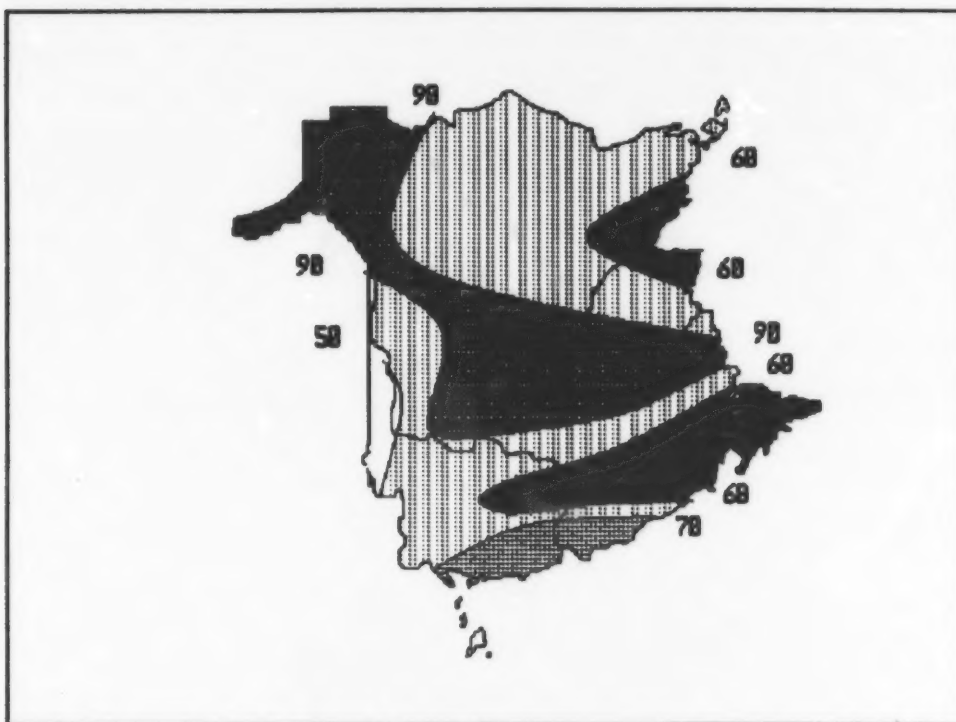


Figure 5. Total precipitation as a percent of normal for September, 1988.

EVALUATING ANNUAL WINDBREAKS FOR PEPPER

George S. Read

ABSTRACT: A windbreak trial was conducted at the Hoyt Horticultural Center in 1988. Four replicates (8m x 16m) of pepper cv. New Ace were exposed to two rows 16m long on either side of the plots of the following treatments; direct seeded sunflowers, 1.2m tall plastic snowfence (50% porosity) and the control plots. The overall wind reduction was approximately 30 percent. Black plastic 1m wide was used for weed control. The early harvests showed yield increases of 70-100 percent in both the sunflowers and snowfence compared to the control at the 0.05% percent level. Later harvests showed a smaller yield increase for plastic snowfence and after four harvest dates sunflowers actually decreased yields compared to control.

ÉVALUATION DE L'EFFET DES BRISE-VENT SUR LES POIVRONS

Résumé: L'évaluation de brise-vent a eu lieu en 1988 au Centre horticole de Hoyt. On a délimité quatre parcelles témoins de cultivars de poivron New Ace de 16 mètres sur 8 mètres. Un rang de tournesols de 16 m de long a été semé de chaque côté de quatre autres parcelles identiques, et l'on a installé une clôture à neige de plastique de 1,2 m de haut (50 % de porosité) de part et d'autre de quatre autres parcelles. En général, la vitesse du vent a été réduite d'environ 30 %. On a utilisé une bande de plastique noir d'un mètre de largeur pour empêcher la croissance des mauvaises herbes. L'augmentation du rendement lors des premières récoltes était de l'ordre de 70 à 100 % dans les parcelles protégées par les tournesols et la clôture à neige, compte tenu d'une marge de tolérance de 0,05 %. Lors des récoltes subséquentes, l'augmentation du rendement était inférieure dans les parcelles protégées par la clôture à neige. Après la quatrième récolte, les poivrons protégés par les tournesols ont donné un rendement inférieur à celui des poivrons non protégés. On pense que ce résultat est dû à l'ombre projetée par les tournesols ou à l'effet des engrais. On étudie l'aspect économique de ces méthodes.

INTRODUCTION: Previous work on windbreaks (Read, 1987) resulted in large yield increases. Most literature on windbreaks show year-to-year variability in the amount of response of the crop to the windbreak. It is therefore important to evaluate windbreaks over a number of differing seasons.

The cost of windbreaks must be considered. This trial looks at the annual cost of plastic snowfence vs. direct seeded sunflowers and the return on the investment based on early and later season prices for the commodity.

MATERIALS: A trial was established at the Hoyt Provincial Nursery in 1988 to evaluate annual windbreaks both living and artificial. The trial consisted of 12 plots (16m x 8m) distributed over a five acre site to minimize the interaction of one windbreak on another. Three treatments; control, plastic snowfence and direct seeded sunflowers were replicated four times in the randomized block design. The sunflowers were seeded on May 26, 1988. The peppers were transplanted on June 15, 1988. The pH tested uniformly throughout the field. Fertility consisted of a preplant application of 400 lbs/acre of 15-15-15. The peppers were transplanted at

12" spacing in the centre of a 3' row of black plastic. Observations were made on flowering and fruit set periodically. Harvests commenced on August 5, 1988 and were taken on August 8, August 12, August 16, August 22, and August 29. Windspeed reductions were periodically sampled and compared for the sunflowers and plastic, versus the control plots. Graded yields were determined using first, second and cull classifications. Plots were closely monitored for disease and insect problems of which there were none. Based upon plant observations, no further fertility was applied.

RESULTS AND DISCUSSION: Thirty plants were selected from the first row located five feet from the windbreak. Each plot was observed for flower and fruit development. The first flower count was taken on July 15th, 1988. The results of the flower counts are given in table 1.

Table 1. A comparison of pepper flower count on row one between control, sunflower and plastic snowfence, from July 15 to August 3, 1988, at Hoyt.

Date	Treatment		Rep 1	Rep 2	Rep 3	Rep 4	Aver
07/15	control	a*	2	3	2	3	2.5
	sunflower	b	10	2	10	14	9.0
	snowfence	b	10	5	7	15	9.3
07/27	control	a	146	102	87	91	107
	sunflower	a	103	90	118	108	105
	snowfence	a	167	144	121	135	142
08/03	control	a	140	109	97	89	109
	sunflower	a	65	88	113	99	91
	snowfence	a	115	134	95	124	117

* Different letters indicate significant differences at 0.05% level using Newman-Kuels multiple comparison test.

Fruit count was observed from the same row and the same plants over the same dates. These results are presented in table 2.

Table 2. A comparison of pepper fruit count on row one between control, sunflower and plastic snowfence, from July 15 to August 3, 1988, at Hoyt.

Date	Treatment		Rep 1	Rep 2	Rep 3	Rep 4	Aver
07/15	control	a*	7	8	3	0	4.5
	sunflower	a	8	4	11	14	9.3
	snowfence	a	14	10	7	10	10.3
07/27	control	a	98	66	71	77	78
	sunflower	a	92	78	87	85	86
	snowfence	b	109	87	99	131	107
08/03	control	a	285	204	201	210	225
	sunflower	a	190	204	268	220	221
	snowfence	a	263	271	239	326	275

* Different letters indicate significant differences at 0.05% level using Newman-Kuels multiple comparison test. A seasonal picture of mature fruit harvesting over six dates is presented in figure 1. The harvest on August 8th showed that the snowfence treatment was significantly greater than control at the 0.10 level. With a yield increase of 103%. The August 22 and August 29 harvest dates showed that sunflower treatments were significantly different than the snowfence treatment at the 0.05% level. The sunflowers were actually 29% less yield than the control on the August 22 date and 46% less on the August 29 date. The negative influences of the sunflowers is not clear. All other dates did not show statistical significance in total mature fruit number.

When graded yields were compared however, windbreaks had a positive effect on quality of the harvest. The following harvests dates for number one grade had statistically significant results; August 5, showed both snowfence and sunflowers out yielded the control plot (at 0.05% level) by 118% and 75% respectively.

CONCLUSIONS: In this year, the negative effect of the sunflower windbreak in later yields has not been accounted for. This effect was not found for the snowfence. It is very possible that the wind reduction characteristics of the sunflowers changed to the point of giving a solid wall effect which would create turbulence for the peppers. (A double row of sunflowers was used, which became very dense later in the season.) The earliest yields had very positive responses to both the snowfence and sunflowers. Due to the significant saving in cost of the living windbreak it is important to do further testing of this alternative to artificial breaks such as snowfence.

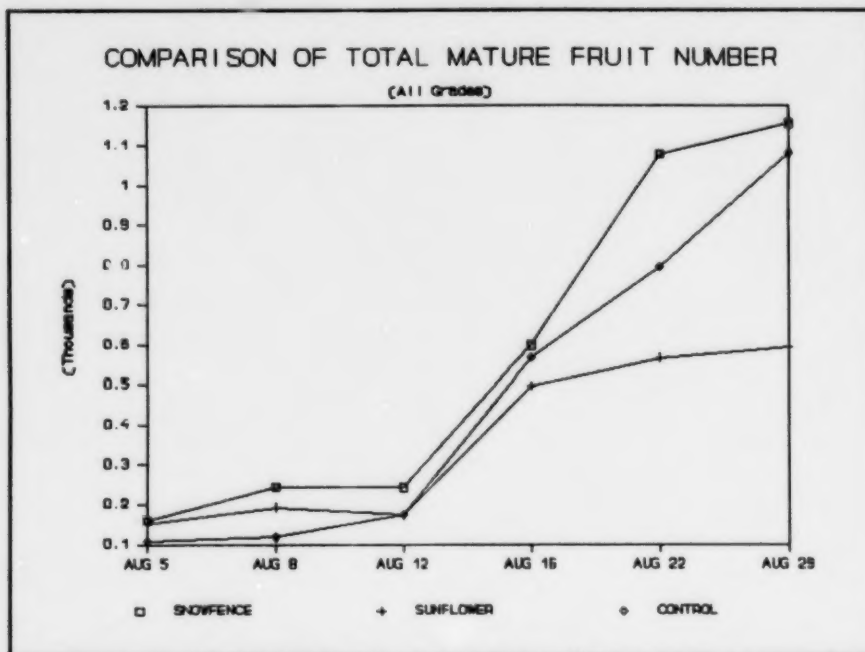


Figure 1. A comparison of total mature fruit number (all grades) over six harvest dates at Hoyt N.B., 1988.

ACKNOWLEDGEMENTS: The author would like to thank summer students R. Nigum and N. Smith for there considerable work in planting, maintaining and harvesting the trial, in addition thanks are extended to the staff of the Horticultural Nursery for theirs assistance on numerous occasions.

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A PRELIMINARY LOOK AT A PTO DRIVEN FAN FOR FROST PROTECTION IN AN APPLE ORCHARD

George S. Read¹ and Robert L. Bourgeois²

ABSTRACT: A large PTO driven fan was mounted on the back of a tractor and used to mix the air on a slope under conditions of strong radiative cooling. The temperatures warmed approximately 1.5 to 2.0 degrees celsius each of the three times the fan was operated between 5 am and 7 am on May 26, 1988 at Pres de Haut, New Brunswick.

UTILISATION D'UN VENTILATEUR À TRACTION MÉCANIQUE POUR ASSURER LA PROTECTION DES VERGERS CONTRE LE GEL - OBSERVATIONS PRÉLIMINAIRES -

Résumé: Un gros ventilateur à traction mécanique a été monté sur l'arrière d'un tracteur et utilisé pour mélanger l'air sur une pente sujette à d'importants refroidissements par radiation. La température s'est réchauffée de 1,5 à 2° C à chacune des trois fois où le ventilateur a fonctionné entre 5 h et 7 h du matin le 26 mai 1988 à Pré-d'en-Haut (Nouveau-Brunswick).

INTRODUCTION: Mixing of cold air in contact with the ground with warmer air above it can result in reducing or preventing frost occurrence when the temperatures are near freezing. It is essential however to have warm air available for this procedure to work. On nights when strong radiative cooling takes place, cold air develops next to the ground as heat is lost to the atmosphere. This colder air being denser than warm air will flow down slopes and accumulate in depressions and thereby increase the risk of frost in these locations. The air up the slope and from 5 to 100 meters above the depression is often 1 to 5 degrees warmer than the air in the lowest land forms.

When such conditions exist it may be beneficial to introduce the warm air aloft with the cold air below.

Large wind machines are used in various parts of the world, primarily in citrus and apples. The effectiveness both operationally and economically depends on the area they cover, the strength of the inversion, and the topography of the area (Davis, 1977). These systems have to be compared to irrigation as to which is the correct choice for protection.

In certain circumstances such as the location tested here it may be desirable to have a small fan (with lower costs) to protect small and numerous depressions, where one or several fans can be moved or operated by existing farm tractors. The effectiveness of these fans needs to

be evaluated.

METHODS: This monitoring of this trial was setup within 24 hours of actual use and the results are preliminary. Further work is required to determine the effectiveness under different inversion conditions, the length of time the fan needs to operate and the coverage and positioning of the fan to optimize the warming.

1 NB Dept. of Agriculture, 2 Apple Producer



Figure 1. Tractor mounted frost fan locations on sloped orchard near Pres de Haut, N.B., May 26, 1988.

The fan manufactured by Brown Co. of Michigan was approximately five feet from blade tip to blade tip. The fan was driven through a PTO by a 70 hp tractor. The fan was positioned two thirds of the way up a 5% slope approximately 200m long. The bottom one third of the slope was part of a large depression characterized by cold air accumulation and early frosts. Temperature probes (thermistors) were located in the valley bottom and at 30 m intervals below and above the tractor. The tractor was moved to the bottom one third of the slope after being operated at the two thirds position. The temperature probes were recorded at one minute intervals by two CR21 Campbell Scientific dataloggers. The temperature sensors were located in the same row as the fan. There was no monitoring to either side of this row.

RESULTS and DISCUSSION: The results were recorded from only one night and at a limited number of positions. The

temperatures warmed by 1.5 to 2.0 degrees celsius at each of the times the fan was operated. The duration of the warming effect lasted about 10 minutes. The fan was positioned at two thirds of the way up the slope and facing down the slope. The warming effect is speculated to have resulted from pushing midslope air down the slope and it in turn being replaced by warmer upslope air. However the tractor also was operated from the lower slope position while pointing the fan upslope. This resulted in some warming although smaller in magnitude. Each of the temperature comparisons were the result of temperature before and within one or two minutes after the fan was operated. It is unlikely the increase in temperature resulted from a change in atmospheric conditions as the sky was clear. Heat from the tractor engine was also ruled out as the warming effect was similar at distances of 5 to 60m from the fan.

The results were encouraging and require further investigation. The benefits of an effective small fan protection system are substantial as it provides apple producers with a low cost portable method of protecting smaller high risk areas, when compared to helicopter or irrigation costs.

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OPTIMISATION OF FERTILITY PRACTICES IN CARROT PRODUCTION ON THE ST. CHARLES BOG

K.T.V. Michalica

ABSTRACT: The positive response of carrots to the addition of molybdenum was established in 1987. The entire carrot stand was treated with foliar application of sodium molybdate. The 1988 testing, designed to establish the optimum molybdenum rates, did not bring about expected results. The soil application of molybdenum did not significantly increase total yield but increased marketable yield and quality of carrots.

The addition of lime with or without simultaneous additions of copper and boron did not effect yield and quality of carrots.

Carrots fertilized with an ammonium nitrate form of nitrogen outyielded those fertilized with a urea form of nitrogen in 1988.

OPTIMISATION DES PRATIQUES D'ENRICHISSEMENT DU SOL POUR LA CULTURE DES CAROTTES DANS LA TOURBIÈRE DE SAINT-CHARLES

Résumé: Il a été établi en 1987 que les carottes réagissent bien à l'application de molybdène. En effet, du molybdate de sodium avait été appliqué sur le feuillage de tout le peuplement de carottes. L'essai réalisé en 1988 pour déterminer les taux optimaux d'application de molybdène n'ont pas donné les résultats attendus. L'application de molybdène dans le sol n'a pas amélioré le rendement total, mais il a augmenté le nombre de légumes commercialisables et la qualité des carottes.

L'épandage de chaux avec ou sans additions simultanées de cuivre et de bore n'a pas eu d'effet sur le rendement ni sur la qualité des carottes.

En 1988, les carottes fertilisées à l'azote sous forme de nitrate d'ammonium ont donné un meilleur rendement que les carottes fertilisées à l'azote sous forme d'urée.

INTRODUCTION: On the St. Charles Bog the 1987 carrot production was depressed due to a nutrient imbalance. After foliar application of molybdenum the crop stand appeared somewhat improved. The yield and quality of carrots harvested in 1987 were, nevertheless, substantially lower in comparison to previous years.

The nutrition studies conducted by P. LeBlanc, 1988 showed that soil added molybdenum increased carrot yields twofold. The 1988 plot work was designed to answer the following questions: 1. What are the optimum rates for soil added molybdenum?

2. How effective are the present rates of copper and boron with simultaneous additions of lime?

3. Which form of nitrogen is more suited to carrot production under the present soil and crop management system: urea or ammonium nitrate?

MATERIALS AND METHODS: Molybdenum was applied to soil as a spray solution of sodium molybdate and water prior to the application of other fertilizers and tillage. The following rates were applied: 0, 0.25, 0.50, 1.0, 2.0 and

4.0 kg of molybdenum per hectare. The plots, 16.4 m² in size, were randomized and replicated three times. Plots of the same size were established for comparison of effectiveness of copper and boron with simultaneous additions of lime. Yet another set of similar plots was established to compare the effectiveness of urea versus ammonium nitrate form of nitrogen.

The fields used in the study were field #7 in the "old" development and field #34 in the "new" development.

The plots were seeded and managed by the producers as commercial fields. The fertilizers and lime used on the test plots (kg per hectare) were as follows: nitrogen 150 (urea), phosphorus 100, potassium 200, copper 5, boron 1.5 and dolomitic lime 2000. The pH of both fields #7 and #34 prior to application of lime or fertilizers was 5.6.

The yield data were collected by manual harvest of carrots from 5 m rows on September 14 (field #7) and 15 (field #34); the weighing and sorting by size followed.

RESULTS AND DISCUSSION: Based on results of the 1987 fertility trials (Michalica, 1987) fertilizer rates as applied in 1988 have changed dramatically in comparison to those applied in 1987. The amounts of nitrogen, phosphorous and copper were substantially reduced while the rate of potassium was increased.

The carrots emerged uniformly over the entire area of the trial. The carrot stand grown in field #7 was uniform and continued to progress well throughout the growing season. Only a few small patches of nutrient disorders appeared through the entire "old" development in 1988 (Picture 1).

The carrot stand on trial plots (field #34) exhibited severe nutrient disorder symptoms similar to those experienced in previous years. The distribution of the disorder throughout the plot was very spotty; the crop stand did not seem to respond significantly to any treatment.

The yield of carrots from plots established on field #7 ("old" development) ranged from 40.9 to 48.9 t/ha (Table 1). Molybdenum did not significantly increase the total yield of carrots. Nevertheless, both marketable yield and quality were increased (Table 1). The highest total and marketable yield was obtained when 1 kg/ha of molybdenum was applied (Table 1). The addition of lime with or without boron and copper did not affect the yield or quality of carrots (Table 1). Both total and

marketable yield was increased when ammonium nitrate rather than urea was used (Table 1).

The yield of carrots was not affected by any micronutrient treatment or lime on trial plots established on field #34 ("new" development). The total yield ranged from 15.0 to 22.4 t/ha. The quality of carrots was somewhat improved by molybdenum fertilization (Table 2). Both yield and quality of carrots were improved by the application of ammonium nitrate as a source of nitrogen in contrast to plots where urea was used (Table 2).

The results obtained from 1988 plot trials are quite significant. The finding that carrot yields were improved when fertilized with ammonium nitrate as compared to urea should be considered in commercial recommendations.

Molybdenum did not improve carrot yields as much as predicted from fertility trials (P. LeBlanc, 1988). The reason for small response may be related to the residual effect of the 1987 commercial application of molybdenum and the reduced amounts of copper that were applied to the plot site prior to this study.

RECOMMENDATIONS: 1. The commercial fertilizer to be used in 1989 should contain nitrogen in the form of ammonium nitrate.

2. Molybdenum (1 kg/ha) should be considered as a soil amendment in 1989 even though the positive effect on 1988 crop was observed on marketable yield and quality rather than on total yield. The amount of molybdenum used is small, its price is low and there is no danger of creating molybdenum toxicity when recommended rates are used.

3. The rates of copper and boron fertilization should be re-evaluated.

4. The comparison of effectiveness of ammonium nitrate vs. urea should continue yet for another year.

ACKNOWLEDGEMENTS: The co-operation and assistance of the management and members of the St. Charles Vegetable Producers Co-operation Ltd. were greatly appreciated. The assistance of Mr. G. Chevrier, Vegetable Specialist, Linda Rankin, Technician, André Levesque, summer student and my son Mark during plot management and data collection is acknowledged and appreciated.

TABLE 1: YIELD AND QUALITY OF CARROTS AS AFFECTED BY ADDITIONS OF FERTILIZERS AND LIME (FIELD #7, "OLD" DEVELOPMENT)

Treatment	Yield, kg/5 m single row				Total Yield t/ha	Deviation from control %
	Canada #1	Canada #2	Cull	Total		
Control	10.01	0.43	2.03	12.47	42.2+	0.0
0.25 kg/ha Mo	10.60	0.50	1.07	12.17	41.4+	- 1.9
0.5 kg/ha Mo	11.17	0.50	0.77°	12.44	42.3*	+ 0.2
1.0 kg/ha Mo	11.93°	0.77	0.93°	13.63	46.4*	+ 10.0
2.0 kg/ha Mo	10.74	0.23	1.13	12.10	41.1	- 2.7
4.0 kg/ha Mo	9.97	0.70	1.37	12.04	40.9	- 3.2
lime - B - Mo - Cu	11.73	0.47	0.70	12.90	43.9*	--
lime + B - Mo + Cu	10.73	0.30	1.44	12.47	42.4	--
control, urea	10.80	0.53	1.44	12.77	43.4+	0.0
ammonium nitrate	12.60	0.47	1.30	14.37	48.9	+ 12.7

° significant at .05 level (Duncan's Multiple Range Test)

+ non-uniform; short carrots

* uniform, long carrots

TABLE 2: YIELD AND QUALITY OF CARROTS AS AFFECTED BY ADDITIONS OF FERTILIZERS AND LIME (FIELD # 34, "NEW" DEVELOPMENT)

Treatment	Yield, kg/5 m single row				Total Yield t/ha	Deviation from control %
	Canada #1	Canada #2	Cull	Total		
Control	2.97	1.73	1.00	5.70	19.4	0.0
0.25 kg/ha Mo	4.10	1.13	1.27	6.50	22.1+	+ 13.9
0.5 kg/ha Mo	3.47	1.60	1.13	6.20	21.1	+ 8.8
1.0 kg/ha Mo	3.43	1.23	0.87	5.53	18.8*	- 3.2
2.0 kg/ha Mo	2.94	1.24	1.20	5.38	18.3*	- 6.0
4.0 kg/ha Mo	3.54	1.33	1.00	5.87	20.0*	+ 3.1
Lime - B - Mo - Cu	2.95	1.70	1.15	5.80	19.6	--
Lime + B - Mo + Cu	2.50	1.50	1.20	5.20	17.7+	--
Lime+B+0.25 Mo -Cu	2.40	1.35	0.75	4.50	15.3	--
Lime+B+0.5 Mo - Cu	2.30	1.35	1.10	4.75	16.2+	--
Lime+B+1.0 Mo - Cu	2.15	1.05	1.20	4.40	15.0	--
Lime+B+2.0 Mo - Cu	2.60	1.15	1.00	4.75	16.2	--
Lime+B+4.0 Mo - Cu	2.30	1.25	1.20	4.75	16.2	--
Lime+B - Mo + Cu	4.10	1.40	1.10	6.60	22.4	--
control, urea	2.65	0.95	0.93	4.53	15.4	--
ammonium nitrate	2.98	0.95	0.95	4.88	16.6*	+ 7.8

! results not statistically significant at .05 level
+ non-uniform; short carrots
* uniform, long carrots

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Picture 1. Crop of carrot in the "old" development (field no. 20) showing signs of a nutritional disorder on the left. August 1988.



EVALUATION OF SAWDUST MULCH AND SOIL DARKENING AGENT FOR DIRECT SEEDED VEGETABLES

K.T.V. Michalica

ABSTRACT: The effectiveness of sawdust mulch with and without subsequent application of a darkening agent was evaluated on beet, broccoli, carrot and cauliflower grown on Interval soil. The sawdust mulch increased emergence of all tested crops with the exception of beet. The higher rate of sawdust did not further increase emergence of broccoli and cauliflower in comparison to the lower rate and even reduced emergence of carrot. The darkening agent applied over the sawdust mulch further increased the emergence of carrots but did not affect emergence of broccoli and cauliflower.

ÉVALUATION D'UN PAILLIS DE SCIURE ET D'UN PRODUIT DE NOIRCISSEMENT DU SOL SUR LES LÉGUMES SEMÉS EN PLEINE TERRE

Résumé: On a évalué l'effet d'un paillis de sciure utilisé seul et utilisé avec un produit de noircissement sur des betteraves, du brocoli, des carottes et des choux-fleurs semés sur un sol de type Interval. Le paillis de sciure a favorisé l'émergence de toutes les cultures à l'essai sauf la betterave. Une couche épaisse de sciure ne favorise pas plus l'émergence du brocoli et du chou-fleur qu'une couche mince, et elle réduit même l'émergence des carottes. Le produit noircissant appliqué sur la couche de sciure a favorisé l'émergence des carottes, mais il n'a eu aucun effet sur l'émergence du brocoli et du chou-fleur.

INTRODUCTION: A semi-commercial trial with the aim of evaluating efficiency of sawdust mulch and soil darkening on emergence of direct-seeded vegetables was established on several fields in Maugerville and Sheffield, N.B. Based on previous favorable results with the use of these technologies, (Read, 1987, Michalica, 1987) the scope of this study was two fold:

1. To evaluate emergence of several commercial direct-seeded vegetables as affected by the application of sawdust (two rates) and by subsequent application of a darkening agent.
2. To provide information on efficiency and field experience with a commercial application of sawdust mulch.

MATERIALS AND METHODS: Beet, broccoli, carrot and cauliflower were direct-seeded by two vegetable producers on the Interval soil, in Maugerville and Sheffield, N.B. The total area involved in this investigation comprised approximately two hectares (Picture 1).

The carrot crop was seeded on June 2 and 3, 1988. Beet, broccoli and cauliflower crops were seeded on June 4. The sawdust was spread over the rows immediately after seeding. The Egedal spreader that formed approximately 10 cm wide bands of mulch over the seeded rows was used (Michalica, Everett, 1985).

Two rates of sawdust, 5 and 10 m³ per hectare were used. The suspension of charcoal in water (Read, 1987) was sprayed on randomly selected rows by means of a back-pack sprayer.

RESULTS AND DISCUSSION: The emergence of carrots was substantially increased by application of the lower rate of sawdust mulch (Tables 1 and 2). The higher rate of sawdust without a subsequent application of a soil darkening agent decreased carrot emergence in comparison with the control. The darkening agent applied over sawdust mulch further increased the emergence of carrots (Tables 1 and 2).

Sawdust mulch increased the germination of broccoli and cauliflower but decreased the emergence of beets. The higher rate of sawdust and the application of the darkening agent did not improve emergence any further (Table 3, 4, 5).

The effectiveness of sawdust mulch was negatively affected by the weather pattern during crop emergence. There was no rain experienced between seeding and crop emergence. As a result, no crust formed on the soil surface and consequently, the potential of more substantial emergence increase due to sawdust mulch application was diminished. The cold and cloudy weather during this period also reduced crop germination and emergence and increased weed problem on the plots.

It took approximately two hours to apply sawdust mulch to one hectare when a two row spreader (90 cm spacing) was used. Approximately one half of the total time was spent on the travel time to and from the sawdust pile, filling the hopper and cleaning the spreading mechanism in case of blockage. After experiencing several stoppages due to blockage, screening the sawdust through a 1 x 2 cm opening sieve solved the problem.

Spreading the sawdust mulch over very loose seedbed was found troublesome because of power-wheel slippage. This problem, that was experienced only once, was solved by not filling the hopper to its maximum capacity.

RECOMMENDATIONS: The technology of sawdust mulching was found effective in preventing crusting and substantially improving emergence of some direct-seeded vegetables. The evaluation of the technology on yield and quality of production and its economy should be pursued. The effectiveness of soil darkening agents in combination with sawdust mulch deserves further testing.

TABLE 1: EFFECT OF SAWDUST MULCH AND CHARCOAL SPRAY ON EMERGENCE OF CARROTS (SITE 1)

Treatment	Emergence # of plants per 4 m row		Deviation From Control %
	14 days after seeding	21 days after seeding	
Control	69.5	165.5	0.0
Sawdust 5 m ³ /ha	49.5	230.0	+39.0
Sawdust 10 m ³ /ha	53.5	134.0	-23.5
Sawdust 5 m ³ /ha + charcoal	74.5	313.5	+89.4
Sawdust 10 m ² /ha+charcoal	49.0	206.5	+24.8

TABLE 2: EFFECT OF SAWDUST MULCH AND CHARCOAL SPRAY ON EMERGENCE OF CARROTS (SITE 2)

Treatment	Emergence (21 days after seeding) # of plants per 4 m row	Deviation From Control %
Control	37.3	0.0
Sawdust 5 m ³ /ha	100.7	+170.0
Sawdust 10 m ³ /ha	32.3	- 15.5
Sawdust 5 m ³ /ha + charcoal	90.3	+142.1
Sawdust 10 m ² /ha+charcoal	63.0	+ 68.9

TABLE 3: EFFECT OF SAWDUST MULCH ON EMERGENCE OF BEET

Treatment	Emergence (14 days after seeding) # of plants per 4 m row	Deviation From Control %
Control	253.0	0.0
Sawdust 5 m ³ /ha	218.5	-15.8*
Sawdust 10 m ³ /ha	222.5	-13.7*

*Significant at .05 level (Duncan's Multiple Range Test)

TABLE 4: EFFECT OF SAWDUST MULCH AND SOIL DARKENING ON EMERGENCE OF BROCCOLI

Treatment	Emergence (14 days after seeding) # of plants per 4 m row	Deviation From Control %
Control	2	0.0
Control & Charcoal	1	-50.0
Sawdust 5 m ³ /ha	6	+200.0*
Sawdust 10 m ³ /ha	11.5	+475.0*
Sawdust 5 m ³ /ha + charcoal	2.5	+ 25.0
Sawdust 10 m ³ /ha+charcoal	10.5	+425.0*

*Significant at .05 level (Duncan's Multiple Range Test)

TABLE 5: EFFECT OF SAWDUST MULCH AND SOIL DARKENING ON EMERGENCE OF CAULIFLOWER

Treatment	Emergence (14 days after seeding) # of plants per 4 m row	Deviation From Control %
Control	2.5	0.0
Control & Charcoal	3.0	+ 20.0
Sawdust 5 m ³ /ha	12.5	+400.0*
Sawdust 10 m ³ /ha	7.0	+180.0*
Sawdust 5 m ³ /ha + charcoal	6.5	+160.0*
Sawdust 10 m ³ /ha+charcoal	6.0	+140.0*

*Significant at .05 level (Duncan's Multiple Range Test)

ACKNOWLEDGEMENTS: The co-operation and assistance of producers Karl and Gordon Harvey and Greg Banks is greatly appreciated. The assistance of André Levesque, summer student with N.B. Agriculture during the establishment of research plots and data collection is acknowledged.

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Picture 1: The seeded field after sawdust mulch application.



EFFECTS OF DEEP RIPPING FOLLOWING DRAINAGE ON CROP PRODUCTION

K.T.V. Michalica

ABSTRACT: Deep ripping applied shortly after the drainage tile installation in the fall of 1985 increased the 1988 yields of sweet and red clover underseeded into barley in 1987. The effect of ripping on yield and quality of potatoes was not significant, even though the yields of potatoes from ripped treatments marginally surpassed the yield harvested from unripped control.

A substantial difference in compactness of the subsoil and root penetration was measured by comparing mechanically disturbed and undisturbed subsoil in an open pit three years after the ripping was applied.

EFFETS DU DÉFONCEMENT DU SOL CONSÉCUTIF AU DRAINAGE SUR LA PRODUCTION DE CULTURES

Résumé: Le défoncement du sol effectué peu après l'installation des tuyaux de drainage à l'automne de 1985 a eu pour effet d'accroître en 1988 le rendement du mélilot et du trèfle rouge semés en association avec de l'orge en 1987. Le défoncement n'a pas eu beaucoup d'effet sur le rendement et la qualité des pommes de terre, mais les pommes de terre cultivées dans le sol défoncé ont donné un rendement tout juste supérieur à celui des zones non travaillées.

Une différence importante de la compacité du sous-sol et de la pénétration des racines a été observée entre les zones où l'on a effectué un défoncement et les zones non travaillées dans une fosse à ciel ouvert trois ans après le défoncement.

INTRODUCTION: 1988 was the third growing season following the installation of tile drainage and subsequent deep ripping on a commercial field located in the vicinity of St. André, N.B. The main objective of 1988 data collection was to measure the residual effects of deep ripping on the crop performance, subsoil disturbance and root penetration (Pictures 1 and 2).

MATERIALS AND METHODS: The commercial field, approximately five hectares in size, was divided into plots onto which the deep ripping treatment was performed (varying in depth, spacing and direction in relation to tiles). Individual plots were then further divided into three sections: potatoes, red and sweet clover (Figure 1, Picture 3).

Soil type throughout the field ranges from Holmsville on the upper part of the field into Siegas at the lower slope position. Soil drainage as well as the presence of an impervious subsoil layer called fragipan also increases down the slope. The systematic tile drainage system with laterals placed across the slope at 15 meter intervals covers more than one half of the entire field (Figure 1).

Red and sweet clovers (both Canada Common) were underseeded into barley in 1987. Potatoes (Shepody) were planted and managed as a commercial crop by the producer throughout the 1988. Due to an error in following

instructions for 1988 seeding, one strip of potatoes consisting of plots A, B, C and G was not established. The stands of all crops grown in 1988 within the test site were healthy and uniform with the exception of a poor stand of the sweet clover grown on the unripped (control) plot.

The crop yields were evaluated by manual harvest, weighing and size sorting (potatoes) in the field. The specific gravity of potatoes was established by weighing in air, and water in the laboratory. The clovers were harvested on June 27, the potatoes on August 24. Four randomly selected replicates (10 meter linear single row) of potatoes were harvested from all established treatments. Three randomly selected replicates, each 5 square meters in size, were harvested from all clover plots.

The soil disturbance was measured by sampling undisturbed cores. (7.5 cm in diameter); nine samples were taken from three excavated sites (McKenzie, 1976). Root penetration was established by measuring depth and abundance of sweet clover roots in three excavated sites (Dumanski, 1978). The average of ten measurements was taken.

RESULTS AND DISCUSSION: The potato yields as affected by the various treatments differed marginally. The total tuber yield ranged from 18.0 t/ha (control) to 20.8 t/ha (plot E, ripped across the tiles) (Table 1). Tuber yield was uniformly low from all treatments as the result of premature harvest (August 24). Yield of tubers from ripped plots was from 5 to 11.6% higher in comparison to the control (Table 1). There were no effects on the specific gravity of tubers resulting from the various treatments (Table 1).

The yield of red clover ranged from 14.0 t/ha to 22.0 t/ha fresh weight. The ripped plots outyielded the control by 36 to 50 percent (Table 2).

The yield of sweet clover ranged from 11.3 to 34.0 t/ha. All ripped plots outyielded the control by 87 to 200 percent (Table 2, Pictures 4, 5).

The average soil bulk density measured at 40 cm depth was 1.4 g/cm³ within the ripped and 1.64 g/cm² within the undisturbed subsoil. The maximum root penetration was 73 cm within the ripped and 44.2 cm in undisturbed subsoil.

Root abundance, measured at the depth of 40 cm below soil surface, averaged 6.8 roots per 10 cm² within a rip and 1.5 roots in the undisturbed subsoil (Pictures 6, 7 and 8).

TABLE 1: EFFECT OF DEEP RIPPING ON YIELD AND QUALITY OF POTATOES

Plot Treatment	Replicate Average	Yield of Tubers		Canada #1 %	Canada #2 %	Culls %	Specific Gravity of tubers g/cm ³
		single row kg/10m t/ha	total deviation from control %				
E Ripped across the tiles 150 cm spacing 50 cm depth	1	18.7					
	2	19.0					
	3	19.0					
	4	18.9					
	average	18.9	20.7 +5.0	91.3	7.1	1.6	1.0711
F Ripped across the tiles 200 cm spacing 50 cm depth	1	21.8					
	2	18.4					
	3	21.1					
	4	21.8					
	average	20.8	22.7° +11.6°	87.0	8.8	4.2	1.0702
D Control (not ripped)	1	17.1					
	2	18.1					
	3	18.4					
	4	18.4					
	average	18.0	19.7 0.0	93.6	5.6	0.8	1.0704

*Significant at .05 level (Duncan's Multiple Range Test)

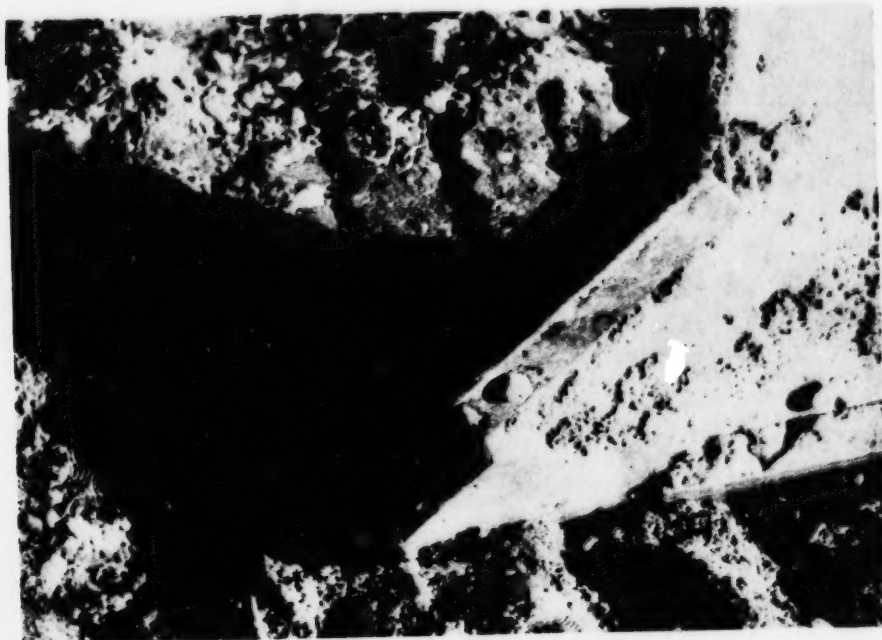
TABLE 2: EFFECT OF DEEP RIPPING ON YIELD OF RED AND SWEET CLOVER

Plot Treatment	Replicate Average	Yield			
		Red Clover		Sweet Clover	
		kg/5 m ²	T/ha	kg/5m ²	T/ha
			Deviation from control %		Deviation from control %
A Ripped along the tiles 200 cm spacing 50 cm depth	1	9.070		14.150	
	2	10.635		19.750	
	3	9.375		17.150	
	average	9.693*	19.39*	17.017*	34.0*
				+38.5*	+200.7*
B Ripped along the tiles 150 cm spacing 90 cm depth	1	10.650		15.500	
	2	9.985		14.900	
	3	10.875		10.050	
	average	10.503*	21.01*	13.483*	27.0*
				+50.0*	+138.3*
C well drained upper part of the slope not tilled not ripped	1	8.935		12.750	
	2	7.885		14.450	
	3	9.095		15.400	
	average	8.638	17.28	14.200*	28.4*
				+23.4	+151.0*
D Control not ripped	1	6.185		6.450	
	2	7.535		5.050	
	3	7.280		5.475	
	average	7.000	14.00	5.658	11.3
				0.0	0.0

TABLE 3: EFFECT OF DEEP RIPPING ON SOIL DISTURBANCE AND ROOT PENETRATION (SWEET CLOVER)

Indicator	Within the Rip		Undisturbed subsoil	
	Individual data	Average	Individual data	Average
Bulk density g/cm ³ at 40 cm depth	1.35, 1.32, 1.41	1.36	1.53, 1.70, 1.69	1.64
	1.28, 1.48, 1.45	1.40	1.49, 1.75, 1.68	1.64
	1.51, 1.40, 1.42	1.44	1.70, 1.64, 1.59	1.64
		1.40		1.64
Root abundance at 40 cm depth per 10 cm ²	5, 4, 6		0, 3, 0, 0	
	10, 7, 6		2, 1, 3, 3,	
	11, 7, 3, 9		2, 1	
		6.8		1.5
Maximum root penetration, cm	68, 76, 69		36, 50, 41	
	73, 76, 71		49, 45, 48,	
	78, 72, 70		43, 47, 39,	
	77		44	
		73.0		44.2

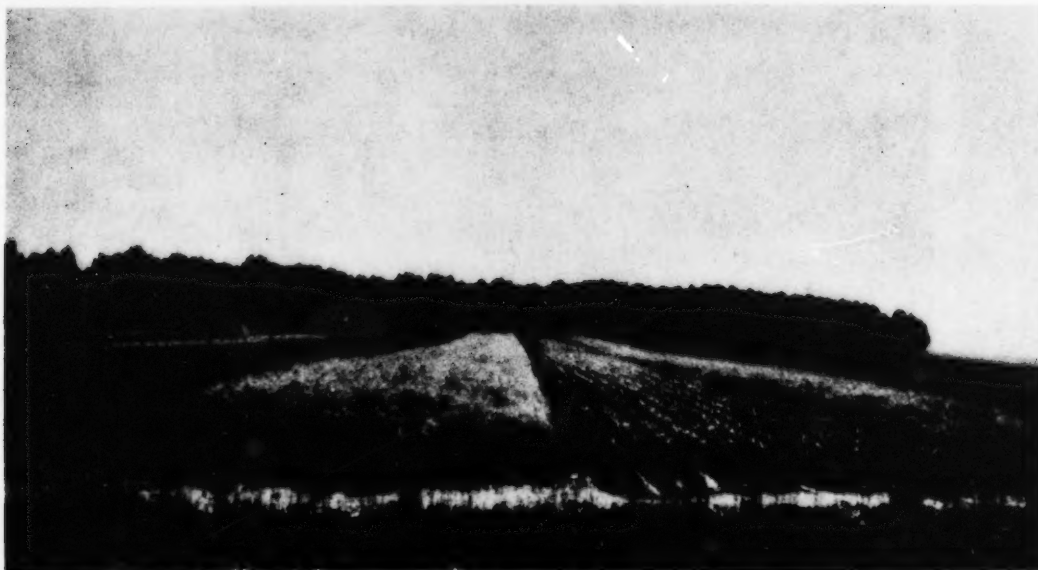
Picture 1: Detail of the chisel utilized for deep ripping in fall of 1985.



Picture 2: Deep ripping in progress, 1985



Picture 3: View on test plots, 1988



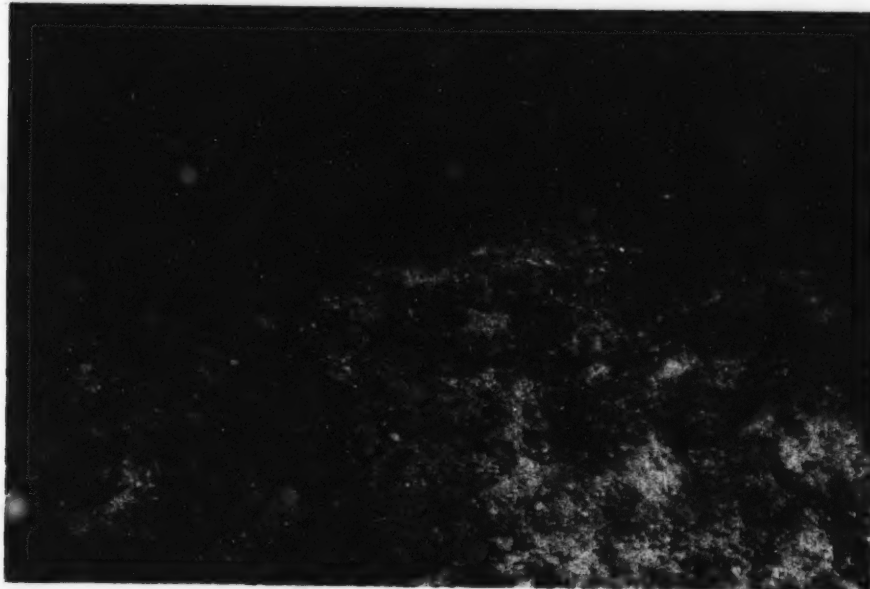
Picture 4: Poor stand of sweet clover - unripped (control).



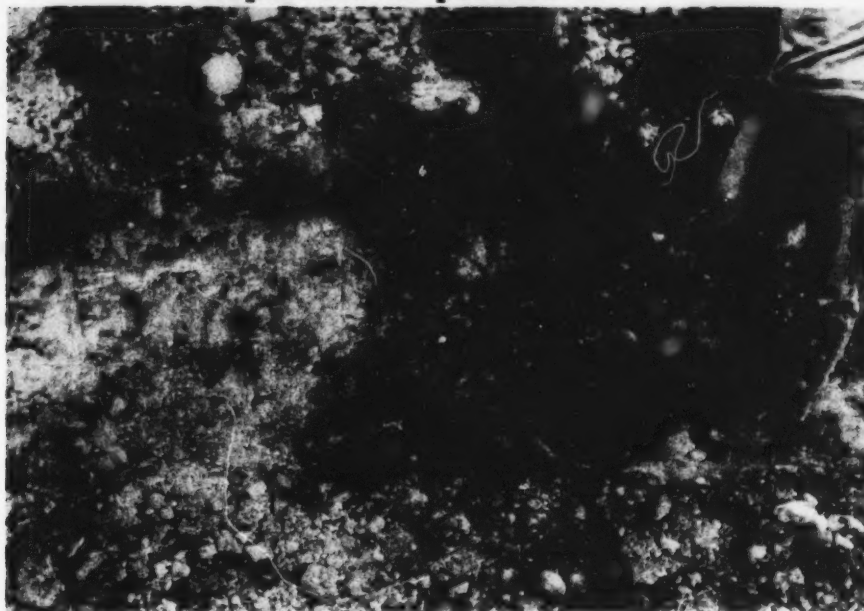
Picture 5: Excellent stand of sweet clover -
 treatment A (ripped).



Picture 6: Compacted subsoil undisturbed by ripping.
 Note shallow root penetration.



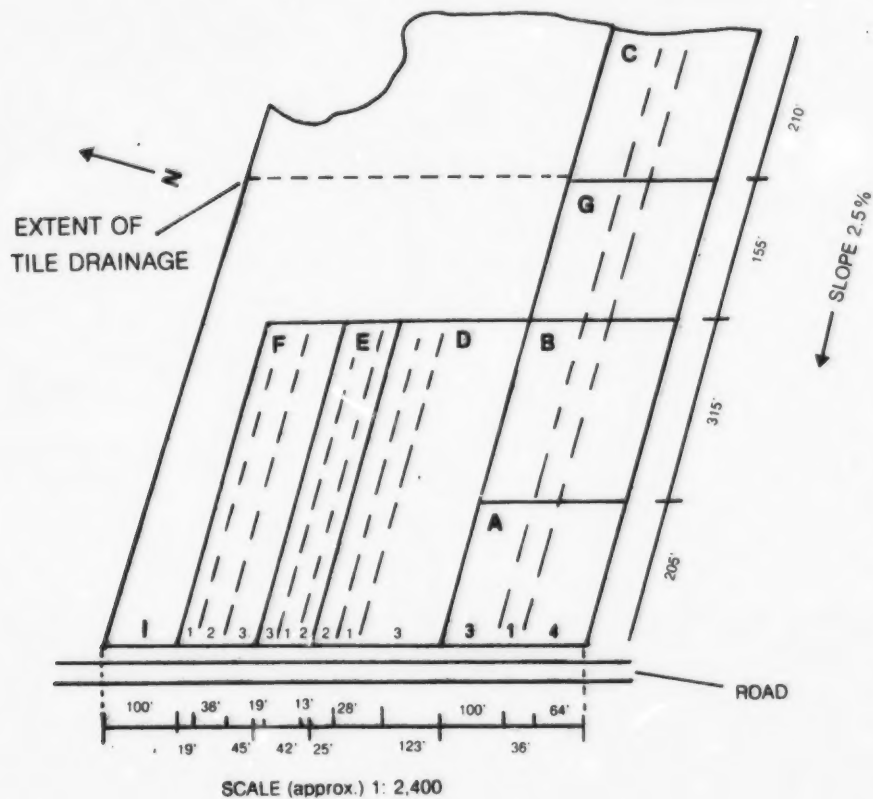
Picture 7: Subsoil disturbed by ripping three years after the operation took place. Note well structured subsoil and the difference in comparison to picture 6.



Picture 8: Detail of root penetration into the subsoil disturbed by ripping - three years after the ripping was performed.



FIGURE 1. - Plot Layout 1988



- A - tilled, subsoiled along tile; 7 ft. spacing, 36 in. depth
- B - tilled, subsoiled along tile; 4-5 ft. spacing, 36 in. depth
- C - non-tiled, non-subsoiled
- D - tilled only
- E - tilled, subsoiled across tile; 4-5 ft. spacing, 22 in. depth
- F - tilled, subsoiled across tile; 6-7 ft. spacing, 22 in. depth
- G - tilled only

- 1 - sweet clover
- 2 - potatoes
- 3 - red clover
- 4 - barley

The effects of deep ripping on yield and quality of potatoes were marginal. One has to take into consideration that potatoes are a shallow rooted, intensively cultivated crop that may not, under conditions of adequate precipitation and drainage, respond to a deep tillage. On the other hand, deep rooted bi-annual crops such as sweet clover would be expected to respond to rooting depth increase. The yield and root proliferation data as obtained in this study supports this assumption. Interpreting the depth of root penetration of sweet clover is yet another angle from which one should view sweet clover as a crop that would prolong beneficial effects of deep ripping.

RECOMMENDATIONS: Crop yield data as affected by the various deep ripping treatments as well as by the rotational crops should be collected in 1989 when the entire field will be seeded in potatoes. The investigations should continue to determine the residual effects of deep ripping on subsoil characteristics and root development.

ACKNOWLEDGEMENTS: Financial support of the Technology Demonstration Program of AFA is greatly appreciated. The co-operation and assistance of Mr. Gilles Godbout a producer of St. André and André Levesque, summer student with the N.B. Agriculture is acknowledged and appreciated.

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A NOTE ON THE USE OF LIQUID FOLIAR CALCIUM SPRAYS ON RUSSET BURBANK AND KENNEBEC POTATOES

R.P. Hinds and I. Ghanem

ABSTRACT: Liquid calcium sprays in the form of "THIS" (a liquid chelated calcium compound) were applied at the rate of 2.8 L/ha on both Russet Burbank and Kennebec during the 1982 growing season. Observations indicated yield reductions of 6% in Kennebec and 15% in Russet Burbank. The foliar sprays seemed to have promoted vegetative growth to the detriment of tuber production.

NOTE SUR LA PULVÉRISATION FOLIAIRE DE CALCIUM LIQUIDE SUR LES POMMES DE TERRE RUSSET BURBANK ET KENNEBEC

Résumé: En 1982, des pulvérisations de calcium liquide sous forme de "THIS" (composé liquide de calcium chélaté) ont été appliquées à raison de 2,8 litres à l'hectare sur les champs de pommes de terre Russet Burbank et Kennebec. Les observations ont indiqué un rendement inférieur de 6 % pour la Kennebec et de 15 % pour la Russet Burbank. Les pulvérisations foliaires ont apparemment eu pour effet de stimuler la croissance végétative au détriment de la production de tubercules.

METHODS: Two applications of liquid calcium "THIS" registered trademark for a liquid chelated calcium compound - at the rate of 2.8 L/ha were imposed at 10 day intervals on Russet Burbank and Kennebec potatoes grown on the Holmesville soil series. One acre plots which were not limed for the previous five years were selected and divided into two half-acre sections; one of which received liquid "THIS" on July 7 and 17, 1982 and the other received the same amount of water.

Specific gravity was done by weighing tubers in air and water.

Specific Gravity = $\frac{\text{weight in air}}{(\text{weight in air} - \text{weight in water})}$

RESULTS AND DISCUSSION: Table 1 shows the effect of "THIS" on specific gravity (S.G.) and yield of Russet Burbank and Kennebec.

TABLE 1: EFFECT OF "THIS" ON SPECIFIC GRAVITY AND YIELD OF RUSSET BURBANK AND KENNEBEC

Treatment	Kennebec		Russet Burbank	
	Yield T/Ha	S.G.	Yield T/Ha	S.G.
Two applications of water - 2.8 L/ha	22.5	1.18	44.4	1.20
Two applications of "THIS" - 2.8 L/ha	21.2	1.17	37.7	1.21
	(6% yield reduction)		(15% yield reduction)	

July of 1982 was a hot, dry month when the sprays were applied. A possible explanation for this yield reduction could be that the foliar calcium sprays promoted vegetative growth to the detriment of tuber production when the rains came in early August. Label recommendations for the product require that the crop be sprayed in inactive growing condition after irrigation or natural rainfall. Sprays in hot, dry weather have been claimed to be not as effective, because of excessive moisture evaporation.

CONCLUSION: Until more detailed evaluations of this product are carried out, applications should proceed cautiously by growers. Limestone applied to the soil based on a soil test is still perhaps the best way to improve calcium levels in the soil and crop.

EFFECT OF SEED TYPE AND SPACING ON YIELD OF DESIRÉE CULTIVAR SEED POTATOES

R.P. Hinds

ABSTRACT: The production of Desirée seed was examined using three seed types; small whole seed 30-45 mm, large whole seed >60 mm and cut seed 45 mm with two intra-row spacings of 30 cm and 20 cm. A split-plot design was employed.

Whole seed plots emerged 2-3 days earlier than cut seed treatments and produced a more even stand of growth. Large whole seed >60 mm produced the highest number of stems/plant and tubers/hill than other treatments.

Though not significant, total yield was maximized with large whole seed >60 mm at 30 cm spacings, a result of greater stems/plant and higher tubers/hill.

There were no significant differences in total yield as a result of seed type or spacings per se, though there were significant differences among the various yield sizes between treatments. Large whole seed >60 mm at 30 cm spacing produced significantly better yields of tubers on the desired 35-55 mm range than other treatments.

EFFET DU TYPE DE SEMENCE ET DE L'ESPACEMENT SUR LE RENDEMENT DU CULTIVAR DE POMME DE SEMENCE DÉSIRÉE

Résumé: La culture de la pomme de terre de semence Désirée a été étudiée avec trois types de semence (petits tubercules entiers de 30 à 45 mm de diamètre, gros tubercules entiers de plus de 60 mm de diamètre, et morceaux de tubercules de 45 mm) et avec deux espacements entre les semences (30 cm et 20 cm).

Les plants produits par les tubercules entiers ont émergé de deux à trois jours avant ceux produits par les morceaux de tubercules, et leur croissance était plus uniforme. Les gros tubercules entiers de plus de 60 mm ont produit un plus grand nombre de tiges par plant et de tubercules par sillon que les plants produits avec les autres types de semence.

Même si l'écart de rendement n'était pas très grand, le meilleur rendement total a été obtenu avec les gros tubercules entiers de plus de 60 mm de diamètre semés à intervalles de 30 cm; on a obtenu plus de tiges par plant et de tubercules par sillon.

Le rendement total divergeait très peu selon le type de semence ou l'espacement des plants dans les rangs, mais des écarts appréciables ont été notés dans la grosseur des tubercules selon le type de semence. Les gros tubercules entiers de 60 mm de diamètre semés à intervalles de 30 cm ont produit plus de tubercules de la grosseur souhaitée (de 35 à 55 mm de diamètre) que les autres types de semence.

INTRODUCTION: The recent introductions of yellow-flesh foreign potato cultivars into the New Brunswick system, have created the need to establish management profiles for these new cultivars. Factors which affect yield and quality such as nitrogen rates, intra-row spacings, whole versus cut seed, length of growing season, topkill dates, etc., must be investigated in order to provide producers with the technology required to grow these new varieties and be competitive. Desirée is a Dutch introduction being grown for the Cuban market, which requires tubers in the size range 35-55 mm. This experiment was designed to examine the effects of different seed types and intra-row spacings on the production of Desirée seed for the

Cuban market as part of the process of establishing a management profile for the cultivar.

METHODS: The experiment was a split-plot design with four replicates.

Main plots were:

ST₁ = whole seed 30-45 mm

ST₂ = whole seed >60 mm

ST₃ = cut seed 45 mm

With each seed type, 135 kg/ha each of N, P₂O₅ and K₂O were applied.

Sub Plots were:

S₁ = 20 cm intra-row spacing

S₂ = 30 cm intra-row spacing.

Elite III seed was planted on June 2, topkilled on August 24 and harvested on September 20. Inter-row spacing was 90 cm. Sub-plot size was 0.007 ha. Rotation practice was potatoes, potatoes, potatoes, grain. Soil test was taken prior to planting. Leaf sampling was done at mid-season. The growing season commenced unusually cold for May and June followed by normal temperatures during July and August.

RESULTS: Emergence and Growth: Emergence was 2-3 days earlier in the whole seed plots and as such, there was more rapid growth on the initial stages. This has been confirmed by other workers in New Brunswick (Barclay 1981, Hinds 1987). The large seed type produced a better stand than the other seed types, but among all the seed types, 20 cm spacing plots were more even than 30 cm spacing plots. Throughout the entire growing season, the larger whole seed plots with 20 cm spacing had a better stand.

Counts of stems/plant above ground and tubers/hill were made from selected plots of 50 random plants four weeks after tuberization. Data on stems/plants and tubers/hill are given in Table 1 below:

Whole seed plots produced more stems/plant and tubers/hill than cut seed with the large seed (>60 mm) producing the greatest number of stems/plant and tubers/hill. This is reflected on the yields subsequently to be discussed.

The literature is replete with data showing that plants derived from whole seed produced more stems of even growth than those plants produced from cut seed (Harris,

1978). Indeed, the work of Bean (1978) reported through Harris (1978) showed that the larger the seed size, the greater the number of stems/plant produced and this is supported in our finding.

The results of the soil and leaf analysis taken show that nutrition of the crop was excellent and thus was not a limiting factor in growth, development and yield. Tables 2 and 3 show relevant data.

TABLE 1: *MEAN STEMS/PLANT AND TUBERS/HILL AS AFFECTED BY THREE SEED TYPES AND TWO SPACING LEVELS

Plots Treated	Mean Stems/Plant	Mean Tubers/Hill
Whole seed 30-45 mm and 20 cm spacing	5.3	13.8
Whole seed 30-45 mm and 30 cm spacing	5.4	14.0
Whole seed >60 mm and 20 cm spacing	5.6	16.3
Whole seed >60 mm and 30 cm spacing	6.5	18.5
Cut seed 45 mm and 20 cm spacing	5.4	10.3
Cut seed 45 mm and 30 cm spacing	4.3	11.0
*Mean of 15 locations with 50 random plants		

TABLE 2: MEAN SOIL ANALYSIS RESULTS OF MAIN PLOTS PRIOR TO PLANTING -HOLMESVILLE SOIL SERIES

Plots Treated	pH	P ₂ O ₅ kg/ha	K ₂ O kg/ha	Ca kg/ha	Mg kg/ha
Whole Seed - 30 - 45 mm	5.6	513+	300	1021	155
Cut Seed - 45 mm	5.7	513+	295	1200	156
Whole Seed - >60 mm	5.5	513+	430+	1415	175

TABLE 3: MEAN LEAF ANALYSIS RESULTS DESIRÉE - MID-SEASON

Plots Treated	%					ppm				
	N	P	K	Ca	Mg	Zn	B	Cu	Mn	Fe
-Whole seed 30-45 mm and 20 cm spacing	6.6	.35	3.6	.86	.55	20	34	16	70	88
-Whole seed 30-45 mm and 30 cm spacing	6.6	.31	3.7	1.1	.59	18	33	16	75	90
-Whole seed >60 mm and 20 cm spacing	6.2	.42	3.1	.82	.55	20	38	16	72	89
-Whole seed >60 mm and 30 cm spacing	6.9	.40	3.1	.72	.46	21	35	16	58	94
-Cut Seed - 45 mm and 20 cm spacing	6.9	.43	2.9	.80	.51	72	30	16	52	102
-Cut Seed - 45 mm and 30 cm spacing	6.6	.34	3.9	1.2	.60	20	40	15	90	92

Yield: Table 4 shows the effect of the three seed types at two spacing levels, on the yield of various sizes of Desirée seed.

Effect of Seed Type: There was no significant difference in total yield as a result of seed type. However, in the size range 28-35 and 35-45 mm there were significant differences in yield as a result of seed type. In the size range 28-35 mm, yield from small whole seed was equivalent to that from large whole seed but was significantly better than yield from cut seed. In the size range 35-45, large whole seed produced significantly better yield than small whole seed but equivalent yield with cut seed.

Effect of Intra-row Spacing: There was no significant difference on total yield as a result of spacing. However, in the size range 45-55 mm, yield was significantly better at 30 cm spacing than at 20 cm spacing.

Effect of Seed Type X Spacing Interaction: Even though total yield was not significantly different between interactions, large whole seed (>60 mm) at 30 cm spacing produced the highest yield. In the seed size range of

45-55 mm, large whole seed at 30 cm spacing produced significantly better yields than other treatments. Harris (1978) reported that there are yield differences associated with the number of stems/plant as a consequence of seed type. This is confirmed here as the large whole seed produced the largest number of stems/plant and tubers/hill with a higher yield production.

TABLE 4: SUMMARY OF RESULTS

THE EFFECT OF THREE SEED TYPES AT TWO LEVELS OF SPACINGS ON YIELD OF DESIRÉE SEED

Treatments	Mean Yield - Tonnes/Hectare					
	SIZES - mm					
	38-35	35-45	45-53	55-65	>65	TOTAL
1. Seed Type						
Whole Seed 30-45 mm	2.49 ^A	6.35 ^B	11.65	9.53	1.79	31.81
Whole Seed >60 mm	2.01 ^{AB}	8.31 ^A	11.73	8.60	1.53	32.18
Cut Seed 45 mm	1.41 ^B	6.99 ^{AB}	11.05	8.78	1.84	30.07
2. Spacing Intra-Row						
20 cm	1.86	7.29	10.81 ^B	9.53	1.71	31.20
30 cm	2.08	7.15	12.15 ^A	8.41	1.78	31.51
3. Seed Type X Spacing						
Whole Seed 30-45 mm						
x 20 cm	2.25	7.05	11.35 ^B	9.87	1.47	31.99
Whole Seed 30-45 mm						
x 30 cm	2.73	5.65	11.95 ^B	9.18	2.12	31.63
Whole Seed >60 mm						
x 20 cm	1.77	7.60	9.45 ^B	9.35	1.63	29.80
Whole Seed >60 mm						
x 30 cm	2.25	9.03	14.00 ^A	7.85	1.43	34.56
Cut Seed 45 mm x						
20 cm	1.55	7.21	11.63 ^B	9.35	2.06	31.80
Cut Seed 45 mm x						
20 cm	1.26	6.78	10.48 ^B	8.21	1.61	28.34

Duncan's Multiple Range Test.

Means with the same letter are not significantly different from each other in each class at the 0.05 level.

Table 5 attempts to summarize the effects of seed type and spacing on yield of tubers in the size range 35-55 mm as required for the Cuban market. Large whole seed

>60 mm at 30 cm spacing produced the highest yield and the highest % of total yield in the required size range. Cut seed and small whole seed 30-45 mm produced yield similar to each other.

TABLE 5: YIELD OF DESIRÉE SEED IN THE SIZE RANGE 35-55 MM AT THREE SEED TYPES AND TWO LEVELS OF SPACINGS

Seed Type X Spacing Effects	Yield T/Ha 35-55 mm	% of Total Yield
Whole seed 30-45 mm x 20 cm spacing	18.4	57.5
Whole seed 30-45 mm x 30 cm spacing	17.6	55.6
Whole seed >60 mm x 20 cm spacing	17.05	57.2
Whole seed >60 mm x 30 cm spacing	23.03	66.6
Cut Seed 45 mm x 20 cm spacing	18.84	59.2
Cut Seed 45 mm x 30 cm spacing	17.26	60.9

CONCLUSION: Equivalent total yield can be obtained with small whole seed (30-45 mm), cut seed or large whole seed (>60 mm) at either 20 cm or 30 cm spacing. However, yield was maximized at 30 cm spacing with large whole seed. It is obvious that large whole seed (>60 mm) can be used in the production system after the smaller whole seed is either sold or insufficient quantities are available for planting. There is also greater financial gain to planting large whole seed rather than disposing of them as tablestock at a lower market price. Seed prices are usually higher than tablestock prices.

In addition, a more even stand of crop is produced by the large whole seed planted and with greater number of stems/plant and tubers/hill.

ACKNOWLEDGEMENTS: The writer respectfully acknowledges the efforts of G.P. Côté during the period the work was undertaken.

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NITROGEN RATE AND HARVEST DATE ON YIELD OF POTATO CULTIVAR SHEPODY

R.P. Hinds

ABSTRACT: The production of Shepody for processing in the size range greater than 45 mm, was examined under three levels of fertilizer, N - 135 kg N/ha; 168 kg N/ha and 201 kg N/ha and at two harvest dates, the first at 106 days and the second at 117 days post planting. With each level of N, 135 kg/ha of each K₂O and P₂O₅ were applied. Cut seed with an average weight of 60 g was planted with inter-row spacings of 90 cm. Intra-row spacing was 35 cm.

The lowest rate of fertilizer N of 135 kg N/ha produced significantly better total yields than the other treatments. Harvest date produced no significant difference in total yield, but the later harvest had significantly better yields of tubers greater than 65 mm in diameter. For tubers in the required size range for processing greater than 45 mm, 135 kg N/ha at both an early and late harvest produced significantly better yields than other treatments.

Lower N rates produced tubers with higher specific gravity than higher N rates. Earlier harvests at each N level resulted in French Fries of better colour than later harvests. These findings substantiate Agriculture Canada's management profile for the cultivar Shepody and confirms the negative effects of overfertilization with N currently practiced so widely in the industry.

EFFET DU TAUX D'AZOTE ET DE LA DATE DE RÉCOLTE SUR LE RENDEMENT DES CULTIVARS DE POMME DE TERRE SHEPODY

Résumé: La culture de pommes de terre de transformation Shepody mesurant plus de 45 mm de diamètre a été évaluée selon trois différents taux d'application d'azote (135 kg/ha, 168 kg/ha et 201 kg/ha) et selon deux périodes de végétation (106 jours et 117 jours après la plantation). Chaque application d'azote était accompagnée d'une application de 135 kg/ha de K₂O et de 135 kg/ha de P₂O₅. Des plantons de 60 g en moyenne ont été plantés à tous les 35 cm. On a laissé un espacement de 90 cm entre les rangs.

Les applications de 138 kg/ha d'azote, soit le taux le plus faible, ont donné des rendements totaux beaucoup supérieurs à ceux des autres taux d'application. Aucune différence importante n'a été constatée dans le rendement total compte tenu de la période de récolte, mais les tubercules récoltés plus tard étaient plus gros et mesuraient plus de 65 mm de diamètre. Aux deux dates de récolte, l'application de 135 kg/ha d'azote a donné les meilleurs rendements en ce qui concerne les tubercules de la grosseur requise pour la transformation, soit 45 mm de diamètre et plus.

Les faibles taux d'azote ont produit des tubercules ayant une plus grande densité que celle obtenue avec les taux d'azote plus élevés. Les frites obtenues avec les tubercules de la première récolte avaient toutes une plus belle couleur que celle obtenue avec les tubercules récoltés en dernier, indifféremment du taux d'azote appliqué. Ces résultats appuient la conclusion d'Agriculture Canada pour le cultivar Shepody et montrent bien les effets négatifs d'une application excessive d'azote, une pratique largement répandue dans l'industrie.

INTRODUCTION: During the early 1980's, Agriculture Canada released a new potato cultivar called Shepody with excellent French Fry and tablestock potential. The cultivar had also the tendency in the field to produce oversize tubers, and it was found that tubers over a 1/2 kg were often hollow. In the case of large seed tubers, when these were cut for planting, blind seed sets resulted and in many cases, induced reduced stands.

A management profile published in 1984 for the cultivar suggested the following fertilizer rates:

Seed crop or late August harvest - 675 kg/ha 15-15-15
 September 10 harvest - 900 kg/ha 15-15-15 or less
 September 20 harvest - 900 kg/ha 15-15-15
 Full growing season - 1000 kg/ha 15-15-15

It was noted that the specific gravity of Shepody would be lowered significantly if N fertilization is applied at rates greater than recommended above. As fertilizer N was increased above the recommended rates, the number of oversize tubers increased and, it was noted that as tuber size increased above 400 g, the quality (texture) of French Fries manufactured from those tubers decreased significantly. However, over the past several years, growers who have produced the crop for processing on badly eroded and poorly rotated land, found that yields were low and size of tubers were smaller than the optimum required by the processing industry. This discovery led growers to increase their N fertilization to compensate. N fertilization rates between 108 kg/ha - 250 kg/ha have now become common for this cultivar. The result of this change in recent years has been that higher yields of lower specific gravity were produced but with a loss of colour in French fries. Now, many aspects of potato production are known to affect processing colour out of the field. High sucrose content of tubers is associated with darkening and poor colour of French Fries and chips. The question of colour is a complicated one and Walsh (1986) had suggested ten tips for better chip and French Fry colour in order to introduce some perspectives of the problem. As it relates to processing colour out of the field, five aspects were important for good colour: planting early, lower N fertilizer rates, good maturity of the crop as affected by date of harvest, topkilling the crop slowly and handling the crop gently at harvest.

In the light of the foregoing, this work was undertaken to take another look at fertilizer N rates and dates of harvest and their effect on yield and quality of yield. These factors are easily manipulated by the grower as are date of planting, topkilling and handling at harvest.

METHODS: A split-plot design was used for the experiment utilizing four replicates:

Main plots were:

N₁ = 135 kg/ha nitrogen
 N₂ = 168 kg/ha nitrogen
 N₃ = 201 kg/ha nitrogen

With each application of N, 135 kg/ha each of P_2O_5 and K_2O were applied.

Sub-plots were:

E₁ = early harvest - Sept. 16th

E₂ = late harvest - Sept. 27th

Foundation cut seed was planted on June 2 and topkilling sprays with Diquat were applied on Sept. 7th and 12th. Harvesting was done by hand to reduce bruising. Inter-row spacing was 90 cm. Seed piece weight was 70 g. Sub-plot size was 0.007 ha. Rotation practice was potatoes, potatoes, potatoes, grain. Soil tests were taken prior to planting. Leaf sampling was done at mid-season.

Sucrose rating was done and specific gravity was calculated on the following basis:

Specific gravity = $\frac{\text{weight of tubers in air}}{(\text{weight in air} - \text{weight in water})}$

Chip colour was determined on an Agtron M 30/31 A unit set on the red position. Colour was recorded both in Agtron units and USDA colour ratings 1-7 corresponding to the appropriate Agtron unit.

The growing season commenced unusually cold for May and June followed by normal temperatures during July to September.

RESULTS AND DISCUSSION: Growth: Soil samples taken prior to planting (Table 1) showed adequate nutrient status of the soil. Up to the time of leaf sampling at mid-season, no differences were observed in growth, flowering date, etc. However, after mid-season, treatments with the lowest N rate of 135 kg/ha began to pale and by mid-August were yellow. This yellowing corresponded with a lower N level in the leaf as well (Table 2). Topkilling was easier in the lower N treatments as well. The highest N level treatments remained green up to the time of topkilling.

TABLE 1: MEAN SOIL ANALYSIS RESULTS OF MAIN PLOTS PRIOR TO PLANTING - HOLMESVILLE SOIL SERIES

Plots Treated	pH	P ₂ O ₅ kg/ha	K ₂ O kg/ha	Ca kg/ha	Mg kg/ha
135 kg N/ha	5.6	513+	300	1021	155
168 kg N/ha	5.7	513+	295	1200	156
201 kg N/ha	5.5	513+	430+	1415	175

TABLE 2: MEAN LEAF ANALYSIS RESULTS SHEPODY - MID-SEASON

Plots Treated	%					ppm				
	N	P	K	Ca	Mg	Zn	B	Cu	Mn	Fe
135 kg N/ha	6.0	0.39	3.2	0.86	0.44	27	35	20	78	91
168 kg N/ha	6.6	0.39	3.8	1.1	0.54	30	37	22	95	98
201 kg N/ha	6.4	0.44	3.9	0.85	0.49	32	28	20	71	85

Yield: Table 3 shows the effect of two harvest dates at three levels of nitrogen fertilization on the yield of various sizes of Shepody destined for processing.

There was a significant difference in total yield between the fertilizer N rates with 135 kg N/ha being significantly better than the other rates. The processing industry for French Fries requires large oblong tubers and even in the size range greater than 65 mm, 135 kg N/ha proved the best. These findings support the lower N recommendations made in the management profile for this cultivar.

TABLE 3: SUMMARY OF RESULTS

THE EFFECT OF TWO HARVEST DATES AT THREE LEVELS OF
NITROGEN FERTILIZATION ON YIELD OF SHEPODY VARIETY

Treatments\	Mean Yield - Tonnes/Hectare			
	SIZES - mm			TOTAL
	<45	45-60	>65	
1. Nitrogen Rate				
135 kg N/ha	3.46A	15.98A	16.13A	35.57A
168 kg N/ha	2.50B	16.03A	12.83B	31.36B
201 kg N/ha	3.49A	15.70A	11.80B	30.99B
2. Harvest Date				
Early -Sept. 16	3.18A	17.08A	12.72B	32.98A
Late - Sept. 27	3.12A	14.72B	14.46A	32.30A
3. Nitrogen Rate x Harvest				
135 kg N/ha x early harvest	3.47	16.83	16.45	36.75A
135 kg N/ha x Late Harvest	3.44	15.15	15.80	34.39A
168 kg N/ha x Early harvest	2.53	18.20	11.10	31.83B
168 kg N/ha x Late Harvest	2.47	13.85	14.58	30.90B
201 kg N/ha x Early harvest	3.54	16.23	10.60	30.37B
201 kg N/ha x Late harvest	3.44	15.18	13.00	31.62B

Duncan's Multiple Range Test

Means with the same letter are not significantly different from each other in each class at the 0.05 level.

In terms of total yield - there was no significant difference between an early and late harvest two weeks apart, however, with respect to the large size tubers greater than 60 mm in size, the late harvest was significantly better than the early harvest. In the 45-60 mm range, the reverse was true, where the early harvest produced significantly better yields than the late harvest.

The nitrogen rates x harvest interaction showed that the lower rate of N of 135 kg N/ha at both an early and late harvest was significantly better than higher rates of N in terms of total yield. It should be noted that 135 kg N/ha was the rate suggested in the management profile of this cultivar both early and late harvest. These findings merely confirm the original recommendations.

A look at yields in Table 4 showing the size range greater than 45 mm as required for processing, illustrates again that 135 kg N/ha at both an early or late harvest is the best.

TABLE 4: YIELD OF SHEPODY IN THE SIZE RANGE >45 MM REQUIRED FOR PROCESSING AT TWO HARVEST DATES AND THREE LEVELS OF NITROGEN

Nitrogen x Harvest Date Effect	Yield Tonnes/Ha >45 mm	% Total Yield
135 kg N/ha x Early Harvest	33.28	90%
135 kg N/ha x Late Harvest	30.95	89%
168 kg N/ha x Early Harvest	29.30	92%
168 kg N/ha x Late Harvest	28.43	92%
201 kg N/ha x Early Harvest	26.83	88%
201 kg N/ha x Late Harvest	28.18	89%

Specific Gravity (S.G.): Specific gravity is very important for potatoes destined for processing. It is well known that high N levels combined with a shortened growing season through an early harvest, tend to produce immature tubers of low S.G. High S.G. is mandatory in the processing industry as high S.G. tubers produce a higher yield of French Fries and chips than low S.G. tubers, and also utilize less oil in the manufacturing process (Lulai 1986)

The S.G. offers various treatments are given in Table 5 below:

TABLE 5: SPECIFIC GRAVITY AS AFFECTED BY RATE OF N FERTILIZATION AND DATE OF HARVEST

Treatment	S.G. of Tubers
135 kg N/ha x early harvest	1.070
135 kg N/ha x late harvest	1.068
168 kg N/ha x early harvest	1.065
168 kg N/ha x late harvest	1.063
201 kg N/ha x early harvest	1.061
201 kg N/ha x late harvest	1.063

The trend here is that the lower N rates produced tubers with the higher S.G. and the early harvest, with the exception of the highest rate of N, produced tubers with the higher S.G. The best S.G. of tubers was produced by the lowest N rate of 135 kg N/ha at the early harvest.

Sucrose Content and French Fry Colour:

Many aspects of potato production are known to affect processing colour out of the field. Walsh (1986) listed date of planting, weather, amount of nitrogen affecting maturity, topkilling and handling during harvest. Except for N all the other factors here were constant to all the treatments.

Good colour in French fries and chips is difficult to achieve and is related to the amount of sucrose in the tubers. Since sucrose can be broken down into glucose and fucose (both reducing sugars) high sucrose certainly contributes to loss of colour. Similarly, low sucrose content is related to good colour in French fries and chips.

The role of nitrogen in loss of colour is an indirect one. Overfertilization with N favors top growth over tuber development and so delays tuber maturity. Maturity affects the conversion of sugars to starch, with immature tubers having a greater proportion of sugars to starch and thus likely to produce poor colour in the processed product. Table 6 shows the French fry colour of tubers from the different treatments in both Agtron units and their equivalent U.S.D.A. colour rating on a scale of 1 to 7, where 1 is good colour and 7 is very poor. The U.S.D.A. scale is the one utilized by the processor and up to 4 is acceptable. Sucrose content is given in mg/g. Table 6 shows the relevant data.

TABLE 6: FRENCH FRY COLOUR AND SUCROSE CONTENT AS AFFECTED BY RATE OF N FERTILIZATION AND DATE OF HARVEST PRIOR TO STORAGE.

Treatment	French Fry Colour		Mean Sucrose Content mg/g
	Mean Agtron Unit	Mean USDA Equivalent	
135 kg N/ha x early harvest	82	1.8	1.76
135 kg N/ha x late harvest	66	2.8	1.90
168 kg N/ha x early harvest	75	1.9	1.34
168 kg N/ha x late harvest	76	2.3	1.58
201 kg N/ha x early harvest	84	1.7	1.36
201 kg N/ha x late harvest	79	2.1	1.38

Note: U.S.D.A. colour of 1 -4 is acceptable to Processor. Higher numbers correspond to a worsening of colour.

Given that the relationship between sugars and starch is complicated and scientists are still figuring out the different pathways followed in the conversion of sugars to starch and back to sugars again, it is apparent that the early harvest at each N level has a lower sucrose content than the later harvest. Also the early harvest at each N level has a better colour than the later harvest using the U.S.D.A. colour scale.

CONCLUSION: The work carried out on fertilizer rates of N and harvest dates with the cultivar Shepody suggests that lower rates of N (135 kg N/ha) at both an early or late harvest date produce higher yields of tubers for processing with better specific gravity than higher fertilizer rates of N (168 - 201 kg N/ha). These findings substantiate the recommendations for the cultivar given in the Management Profile of 1984 and clearly indicate that growers who have been fertilizing at rates in excess of 168 kg N/ha have been overfertilizing.

Earlier harvest dates also tend to produce tubers of better processing colour than later harvest dates.

ACKNOWLEDGEMENT: The writer respectfully acknowledges the efforts of G.P. Côté during the period the work was undertaken and to D. McIssac for carrying out the sucrose, colour and specific gravity analysis on tuber samples.

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MONITORING IRRIGATION REQUIREMENTS OF POTATOES USING IRROMETERS

R.P. Hinds

ABSTRACT: The use of irrometers as a means of determining when to irrigate the potato crop was investigated on an eroded Caribou heavy loam soil series in New Brunswick.

On low hills, 18 cm or less in height, the soil in the hill dried out at approximately the same rate as the soil below it. One irrometer installed at a depth of 4-10 cm could monitor the irrigation needs adequately. On high hills, 27 cm or higher in height, the soil in the hill dried out faster than the soil below it. Also, high hills dried out faster than the low hills. Two irrometers may be needed to monitor irrigation needs on high hills.

ÉVALUATION DES BESOINS D'IRRIGATION DES POMMES DE TERRE À L'AIDE D'IRROMETRES

Résumé: L'utilisation d'irromètres pour déterminer le moment d'arroser les pommes de terre a fait l'objet d'étude dans des sols loameux lourds et érodés de type Caribou au Nouveau-Brunswick.

Sur les sillons peu élevés (18 cm ou moins), le sol du sillon s'assèche à peu près à la même vitesse que le sol sous-jacent. Un irromètre enfoncé à une profondeur de 4 à 10 cm a pu évaluer correctement les besoins d'irrigation. Le sol des sillons élevés (27 cm ou plus) s'assèche plus rapidement que le sol sous-jacent. De plus, le sol des sillons élevés s'assèche plus rapidement que celui des sillons peu élevés. Il faudrait peut-être utiliser deux irromètres pour calculer les besoins d'irrigation sur les sillons élevés.

INTRODUCTION:

(a) GENERAL:

While irrigation can permit controlled management of the soil water available to the potato crop in dry periods, its use is not widespread in the potato growing areas of New Brunswick. High temperatures and low soil moisture contents when potato plants are small or initiating tubers, have resulted in deformed tubers, gemmation (secondary tubers) heat sprouts and small plants on recently formed tubers during the 1982 growing season. In addition, even among growers who operated an irrigation system, serious scab problems were observed in Russet Burbank variety normally considered somewhat resistant to scab. Hot, dry weather at tuber initiation is a well-known factor in predisposing to scab problems. So that, while an irrigation system can substantially reduce the ill-effects of moisture stress, growers had no means of deciding when to irrigate, except through gut feelings. During the 1982 cropping season, all the above symptoms typical of moisture stress were in evidence with growers who operated irrigation units.

It was therefore decided during the 1983 crop to use a series of irrometers (tensiometer) to monitor the

irrigation requirements of the potato crop at one grower's farm. This was thought to be a simple, accurate method which can be easily used by the grower.

(b) THE IRROMETER:

The irrometer operates on the tensiometer principle. It consists of a sealed water-filled tube equipped with a porous ceramic tip at the bottom. In dry soil, water is drawn out of the instrument, creating a partial vacuum which is registered on the gauge. The drier the soil, the higher the reading. An irrigation reverses this action. The vacuum previously created in the tube by dry soil draws water from the soil back into the instrument. This, in turn, results in a lower gauge reading.

The range of matric suction over which a tensiometer can operate is 0 to 1.0 bar. Although this may appear to be a small range compared with that over which plant roots are considered to be capable of removing soil water (0 to 15 bars), it includes the major portion of their soil water content for coarse-textured soils.

MATERIALS AND METHODS:

1. Twelve hectares of Russet Burbank variety were monitored by irrometers for irrigation and 1 hectare of the same variety was monitored by irrometers but was not to be irrigated.
2. Four hectares of BelRus variety were monitored by irrometers for irrigation and 1 hectare of the same variety was monitored by irrometers but was not to be irrigated.

Irrometers were located at four stations. At each station, one irrometer (45 cm in length) was installed at a depth of 15 cm below the soil surface in the hill (Irrometer B) and the other (30 cm in length) was installed at a depth of 4 cm below the soil surface in the hill (Irrometer A).

Irrometers (tensiometer) were supplied by the Irrometer Company of Riverside, California, and were graduated from 0 (wet) - 100 (dry) centibars. The following was supplied as a guide by the manufacturer.

- Readings 0 - 10 centibars - Saturated soil.
- Readings 10 - 20 centibars - Field capacity range.
- Readings 30 - 60 centibars - Usual range for starting irrigations. Lower range for sandy, coarse-textured soils.
- Readings 70 centibars and higher - Stress range.

The basic IRRROMETER indicator

CLOSURE

Large cap for easy operation and better control. Cap removed when filling reservoir. Submerged valve gives a positive leakproof seal. Unscrewing cap part way releases air and fills tube. Servicing is instantaneous — a twist of the wrist.

RESERVOIR

Holds a reserve supply of fluid sufficient for several irrigation cycles under average operating conditions. Unscrewing cap part way releases air and fills tube. This is to replace fluid lost by action of drying soil.

ALL JOINTS ARE PERMANENTLY LEAK-PROOF

IRRROMETER FLUID

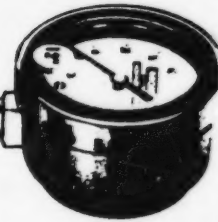
Concentrated solution furnished with IRRROMETERS which when added to water, colors it, for easy reading of water level in the instrument.

CERAMIC TIP

Has many times the strength of conventional tips, porous and responsive to variations in soil moisture.

AIR-FREE GAUGE

The water seal prevents air from entering gauge, as gauge and chamber remain full regardless of water level in instrument.



HERMETICALLY SEALED GAUGE

Accuracy and long gauge life are insured by a hermetically sealed neoprene cover with a molded-in diaphragm which keeps out dirt and moisture and compensates for variations in temperature and barometric pressure.

THE IRRROMETER BODY

Is constructed of tough durable plastic impervious to attack by soil chemicals or electrolysis.

Soil series was the Caribou heavy loam and samples were taken prior to the commencement of the project.

Field capacity was determined by saturating an area of soil (1 metre square) and covering with polythene sheets. The 0 - 30.48 cm. depth was sampled in 15.24 cm depths 48 hours after saturation.

Bulk density was determined using undisturbed soil cores in 15.24 cm. depths up to 30.24 cm. Bulk density was calculated as over-dry weight of soil per unit volume of soil in situ.

Infiltration rates were determined using a double ring infiltrometer on three sites. The second run followed 24 hours after the first.

Permanent Wilting Point was equated with the 15 bar percentage which was determined using a pressure plate apparatus.

Soil moisture was determined by oven-drying the soil. Yield was determined by weighing loaded trucks representing 0.40 hectare in size.

Specific gravity was done by weighing tubers in air and water:

$$\text{Specific Gravity} = \frac{\text{Weight in air}}{(\text{Weight in air} - \text{weight in water})}$$

Fertilizer was applied at planting by banding during the second week of June, 1983. Date harvested - BelRus - September 28th; Russet Burbank - October 14th. Potential evapotranspiration is the amount of water that would be evaporated or transpired from a surface completely covered with vegetation if there was sufficient water in the soil at all times for the use of vegetation. Data was taken from the Atmospheric Environment Service for the period 1941 - 1970 -Table 20 (Thornthwaite, C.W. and Mather, J.R., 1957).

Available water is the difference between the volumes of water at field capacity and P.W.P.

RESULTS AND DISCUSSION:

RESULTS: Data in relation to the soil for the varieties grown are shown in Table 1.

RELATIONSHIP BETWEEN IRROMETER READINGS AND SOIL MOISTURE % BY WEIGHT:

One of the essential ingredients of an irrigation monitoring system is that it should quickly and easily tell the operator when to start irrigating and when to stop. An attempt was therefore made to relate irrometer readings in centibars to the moisture % found in the soil at the depth of the irrometer tip. Figure 1 illustrates such a relationship for the Caribou heavy loam at Woodstock. Irrigation should commence when the irrometer reading is around 70 centibars and should stop when the irrometer reading approaches 10 centibars. At 70 centibars, about 2/3rds of the available moisture is used up and at about 10 centibars P.C. is reached.

AMOUNT OF WATER TO BE USED:

Using an irrometer, irrigation should be carried out until 10 centibars range is approached. Since the infiltration rate (Table 1) of the Caribou soil is about 13.0 cm/hour, between 3 - 4 cm of water per hour could be put on without fear of extensive runoff. The formulas given below from the U.S.D.A. Soil Conservation Service Handbook #82 may be used depending on size of pump to determine the following:

1. Hours required = $\frac{\text{Depth in inches} \times \text{acres in strip}}{\text{Flow in cu. ft. per second}}$
2. Inches depth = $\frac{\text{Flow in cu. ft./second} \times \text{hours run}}{\text{Acres in strip}}$

IRRIGATION INTERVALS AND MOISTURE DEFICITS ON THE CARIBOU HEAVY LOAM:

IRRIGATION INTERVALS:

The available water in the Caribou heavy loam under consideration was 7.62 cm/30.48 cm depth of soil (3.0"/foot depth of soil). Based on 2/3rds of the available moisture being used up and no rainfall, irrigation intervals are indicated in Table 2. Irrigation would be required say, every 12 days during the month of June and every 9 days during the month of July.

MOISTURE DEFICITS:

Table 3 refers. Normally, the months of July and August have the greatest water deficits in the Woodstock area. The deficits in this table are however based on a soil moisture holding capacity of 100 mm. These soils are now so badly eroded and low in organic matter that the moisture holding capacity has dropped to about 80 mm/30.48 cm soil depth (Table 1). Soil moisture deficits are worsened under eroded conditions and create a greater

need to monitor when to irrigate the crop. Even Russet Burbank variety which is scab resistant has tended to scab heavily on badly eroded soils which dry out quickly under hot, dry conditions.

THE IRROMETER MONITORING SYSTEM INSTALLED:

In fields of each variety, two irrometers were placed in a hill at one station when the plants were 7.5 cm in height. The tip of Irrometer A was placed 4 cm below the soil surface at the same depth as the seed piece, and Irrometer B was placed 15 cm below the soil surface in the rooting zone area. Hills are made as the crop grows to allow the tubers to be formed in a loose friable soil.

TABLE 1 - CARIBOU HEAVY LOAM - YIELD AND SOIL ANALYSIS DATA - 1983

SOIL SERIES	VARIETY	TONNES/HA		S.G.	SOIL TEST VALUES kg/ha			
		TOTAL YIELD	MKT YIELD		P ₂ O ₅	K ₂ O	Ca	Mg
Caribou Heavy Loam	Russet Burbank	34.9	29.3	1.1	516+	336+	2000	336
Caribou Heavy Loam	BelRus	18.3	12.5	1.2	516+	336+	2020	336

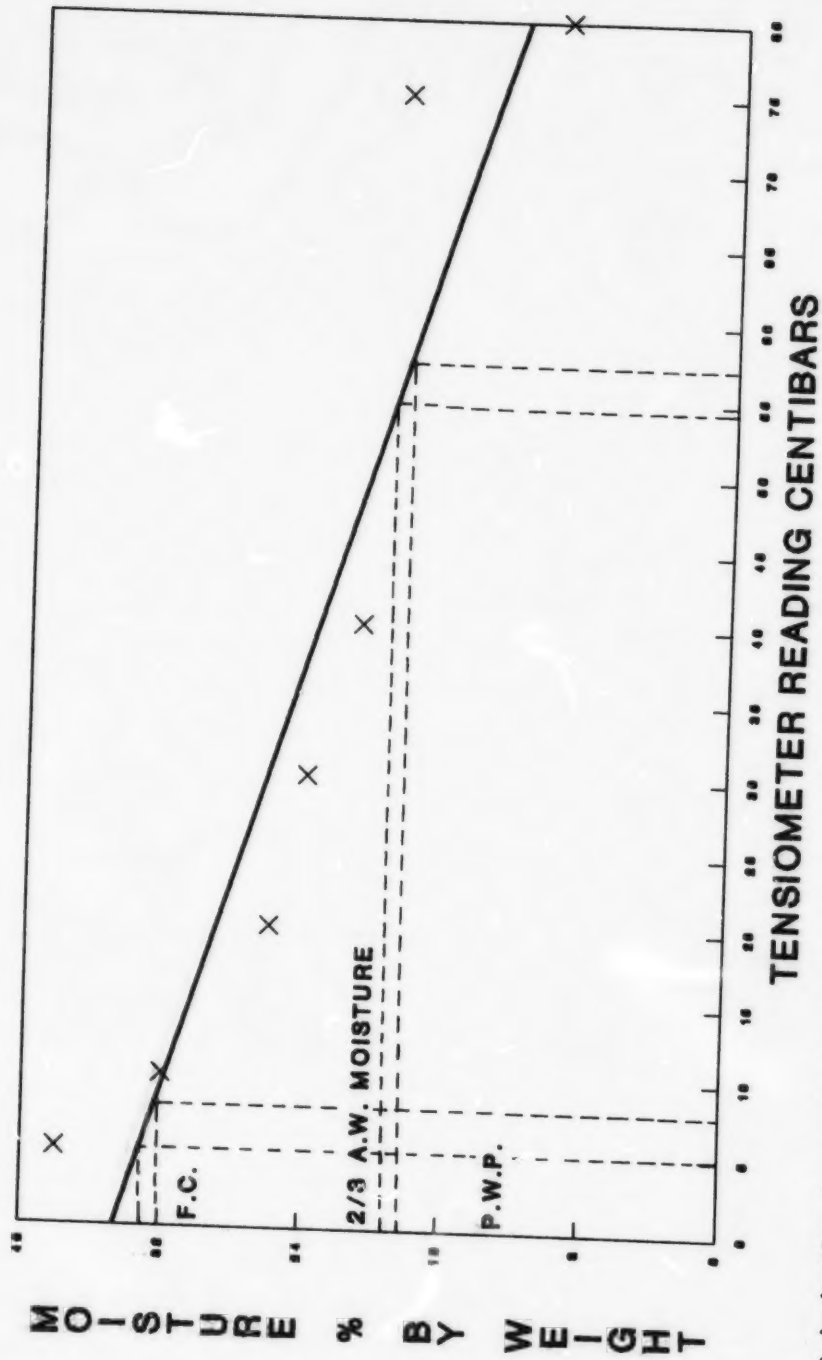
TABLE 1A - CARIBOU HEAVY LOAM - SOIL MOISTURE ANALYSIS DATA - 1983

SOIL SERIES	VARIETY	INFILTRATION RATE		F.C. % MOIST	PWP % MOIST	AW cm/ 30.48	B.D. g/cm ³
		cm/hr	% MOIST				
Caribou Heavy Loam	Russet Burbank	13.9	14.52	32.9	12.48	7.62	1.18
Caribou Heavy Loam	BelRus	12.7	14.52	32.9	12.48	7.62	1.18

ROTATION SEQUENCE: POTATOES, POTATOES, GRAIN, CLOVER

NOTE: ALL HAY FROM PREVIOUS GRAIN CROP PLOUGHED DOWN.

Figure 1
 Relationship between tensiometer reading
 in centibars to moisture %/wt in soil



NOTE: Irrigation is required when 2/3
 available moisture (M) is used up.
 F.C. - 32.9 % (M) P.W.P. - 12.48% (M)

**TABLE 2: IRRIGATION INTERVALS ON CARIBOU HEAVY LOAM
WOODSTOCK INTENSELY CULTIVATED**

Soil Depth	2/3 rds Available Water MM	*RATE OF POTENTIAL EVAPOTRANSPIRATION - MM/DAY				
		MAY	JUNE	JULY	AUG	SEPT
		3.5	4.26	5.5	3.61	2.56
DAYS BETWEEN IRRIGATIONS +						
0 -30.48 CM	51	15	12	9	14	20

+Data from Atmospheric Environment Service for the period 1941-1970.

+Based on 2/3rds available moisture being used up and no rainfall.

**TABLE 3: MOISTURE DEFICIT BY MONTH FOR GRAND FALLS AND
WOODSTOCK WITH A WATER HOLDING CAPACITY OF 100
MM BASED UPON THORNTHWAITE WATER BALANCE P.E.
VALUES 1941-1970. DEFICITS ARE IN MM+**

LOCATION	MONTH						TOTAL
	MAY	JUNE	JULY	AUG	SEPT	OCT	
WOODSTOCK	0	5	31	24	5	0	65
GRAND FALLS	0	1	8	5	0	0	14

*Data courtesy of Atmospheric Environment Service.

**1. MONITORING SYSTEM IN RUSSET BURBANK VARIETY WITH HILLS
27 CM ABOVE THE PLOUGHED SOIL SURFACE:**

Figures 2 - 2b show the irrometer readings of the two irrometers together with rainfall data for the months of July - September.

The irrometer readings closely followed the rainfall pattern indicating that the irrometers were an excellent monitoring system. There was a need to irrigate during the last week of August and the first week of September when the readings were 70 centibars and above.

However, what is interesting is that the moisture content of the hills (measured by Irrometer A) was continuously

Figure 2

Relationship between readings over time
with rainfall of 2 Irrometers
Installed at 4 cm (A) and 16 cm (B) depth below
the soil surface respectively.

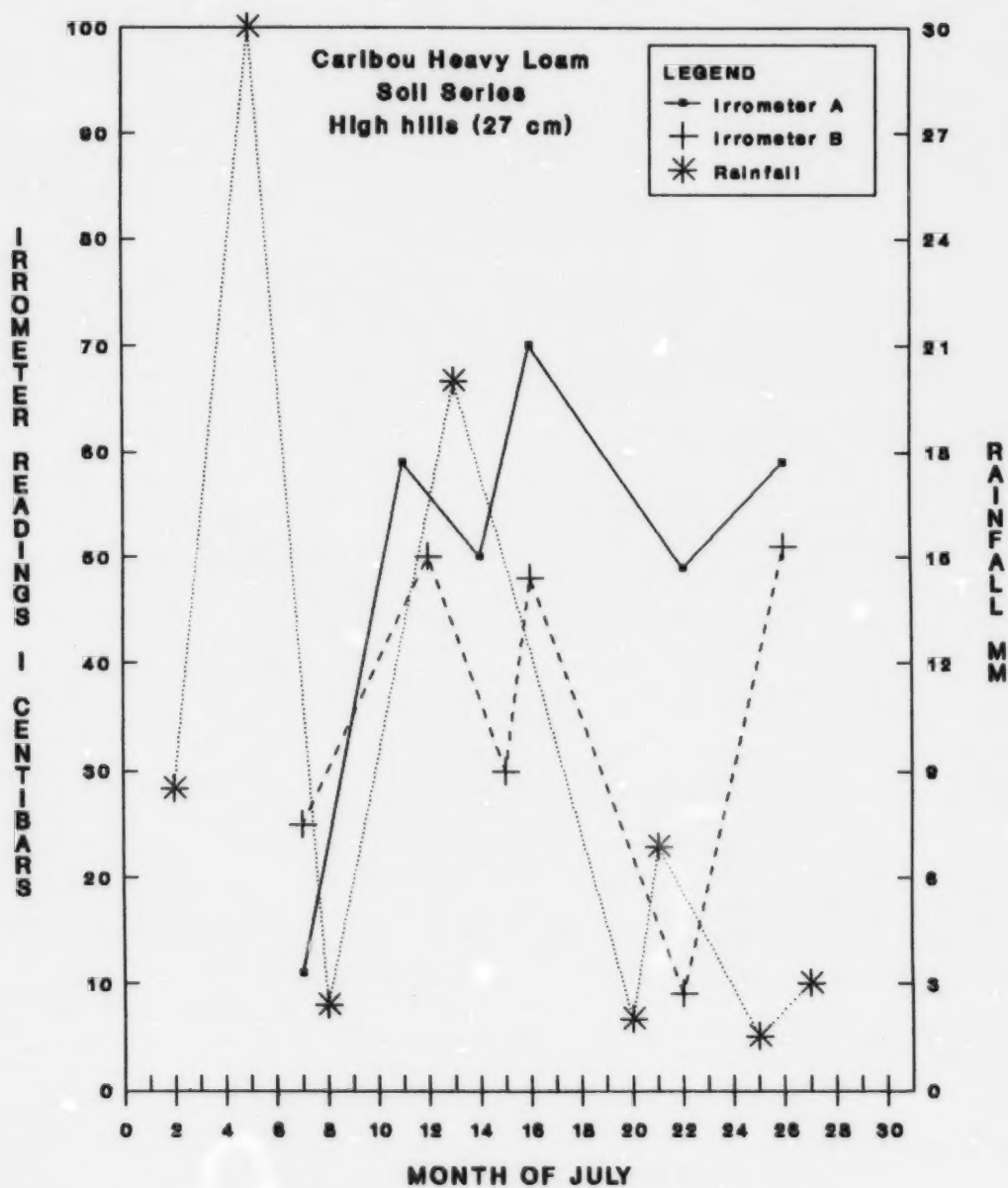


Figure 2A

Relationship between readings over time
with rainfall of 2 Irrometers
Installed at 4 cm (A) and 15 cm (B) depth below
the soil surface respectively.

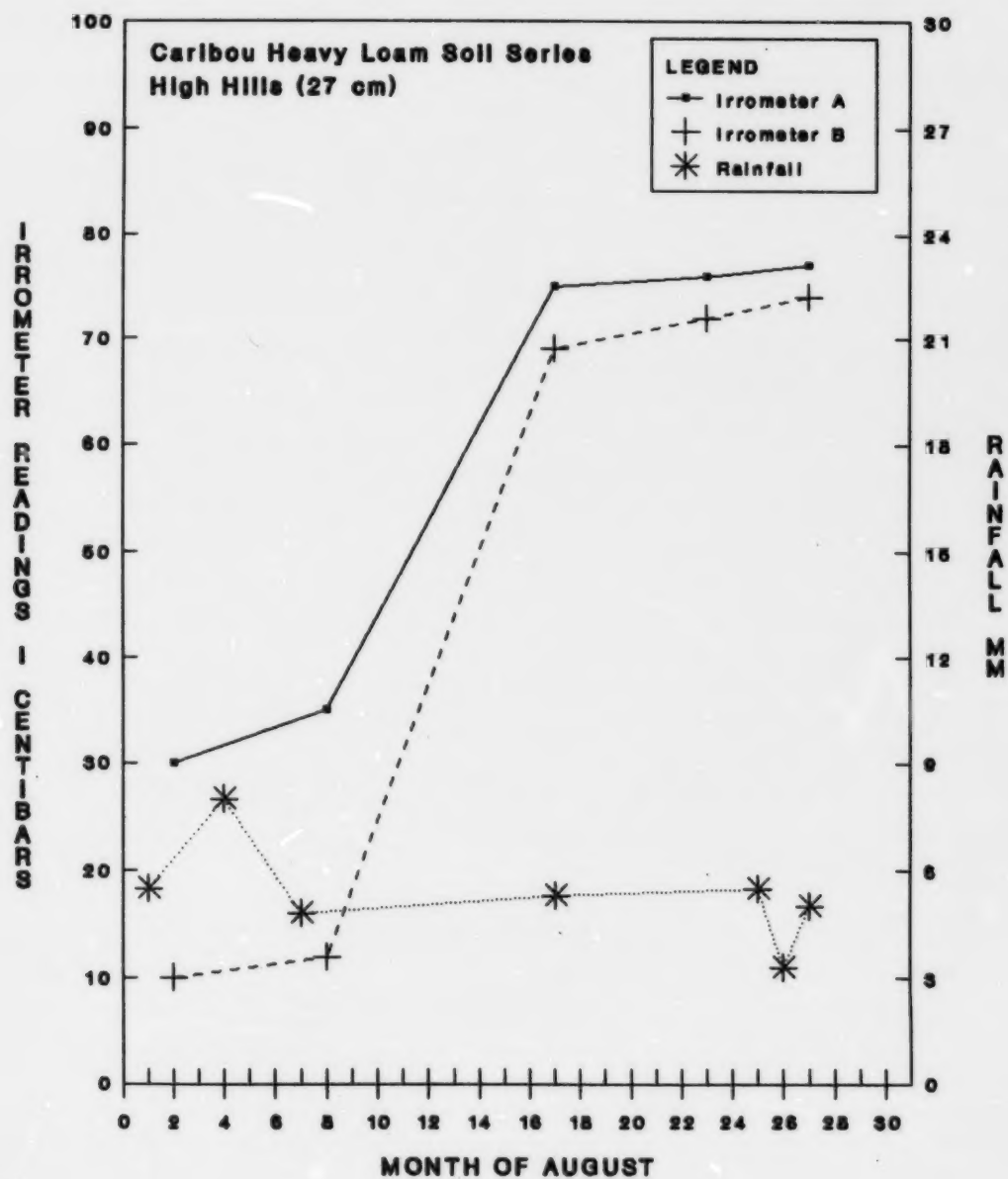
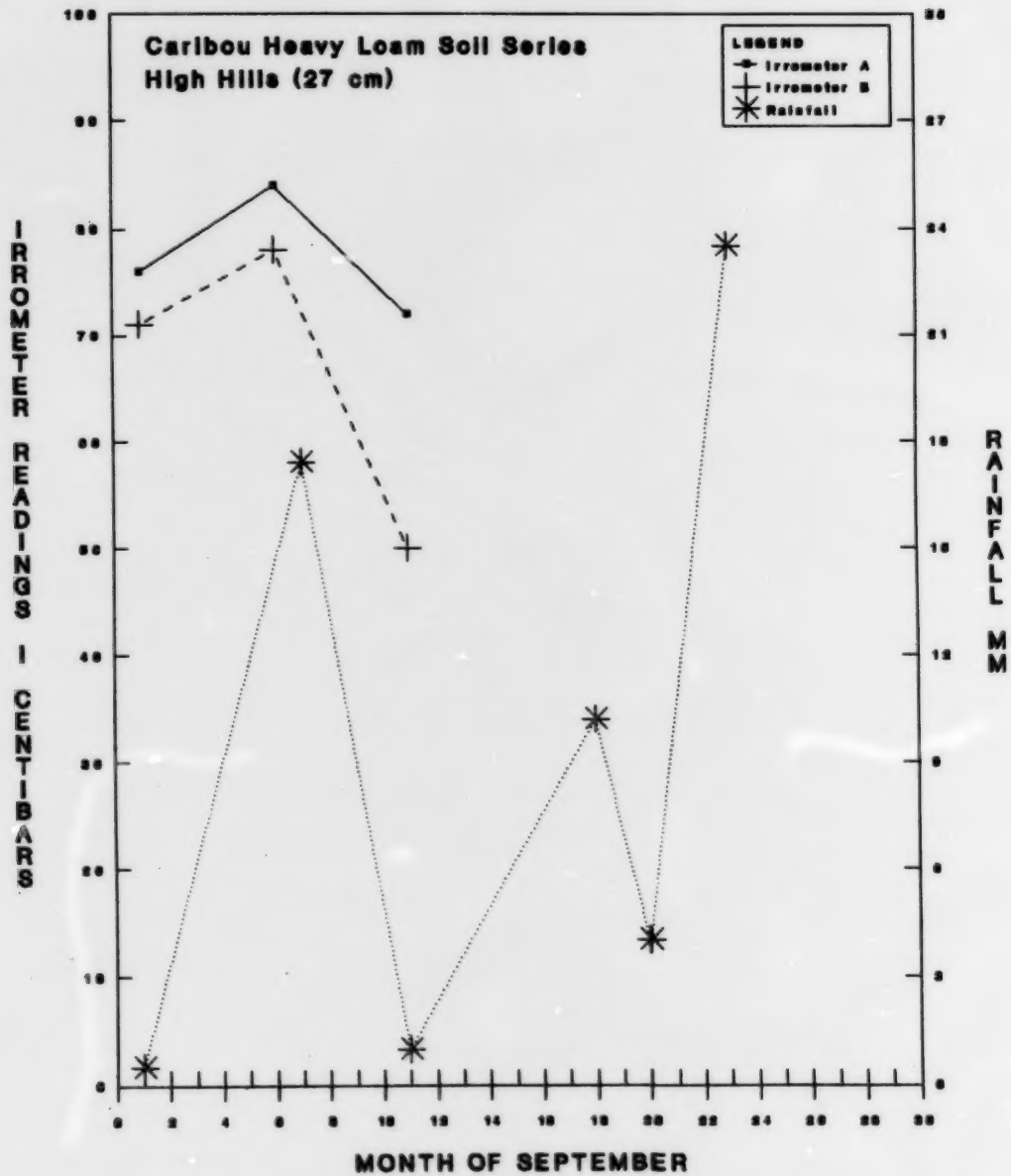


Figure 2B

Relationship between readings over time
with rainfall of 2 Irrometers
installed at 4 cm (A) and 16 cm (B) depth below
the soil surface respectively.



lower than that of the soil below it (measured by Irrometer B). This means that the hills where the tubers are formed were always drier than the soil below it where the roots were growing. So that while the plant exhibited no stress symptoms, the tubers were developing in such a hot, dry environment in the hill, scab was in evidence on the Russet Burbank tubers. This is further evidence that usual methods of determining when to irrigate can be misleading. This also raises the question of which irrometer (A or B) should be used to determine when to irrigate and more particularly the question of whether one should irrigate to satisfy the tuber requirement of the crop or the root growth and top growth requirements of the crop. Since the tuber is the purpose of growing the crop, it is suggested that two irrometers be always placed at one station in a hill. Irrometer A would be used as a guide as to when to irrigate the hill (irrometer readings between 50 - 60 centibars would be a reasonable guide) lightly to keep the hills moist to reduce tuber predisposition to scabbing. Irrigation should be stopped at irrometer readings of 25 centibars or less. Irrometer B would be used to monitor the moisture of the root zone and for overall growth of the crop and irrometer readings of 70 centibars and above would be the benchmark for determining when to start irrigation. Irrigation should be stopped around 10 centibars in the field capacity range.

2. MONITORING SYSTEM IN RUSSET BURBANK AND BELRUS VARIETIES WITH HILLS 18 CM OR LESS ABOVE THE PLOUGHED SOIL SURFACE:

Figures 3 - 3b show the irrometer readings of the two irrometers together with rainfall data for the months of July - September where the hills were flatter (or lower). Here again, the irrometers closely monitored the rainfall patterns, and indicating that there was a need to irrigate during the last week of August and the first week of September when the irrometer readings on both A and B irrometers were 70 centibars and above. In this case, where the hills were flat, both irrometers reflected the same kind of moisture status of both the hills and the soil below it. Though the hills were always slightly drier, either irrometer reading (A or B) could have been used to determine when to irrigate. No scab lesions were observed on Russet Burbank or BelRus under these conditions, even though the moisture situation was identical (i.e. rainfall) to where the crop was growing on high hills. These findings tend to suggest that there might be some relationship between height of hills, moisture regimes of hills and scab incidence as distinct from the moisture regime of the soil below the hill.

Figure 3

Relationship between readings over time
with rainfall of 2 Irrometers
installed at 4 cm (A) and 16 cm (B) depth below
the soil surface respectively.

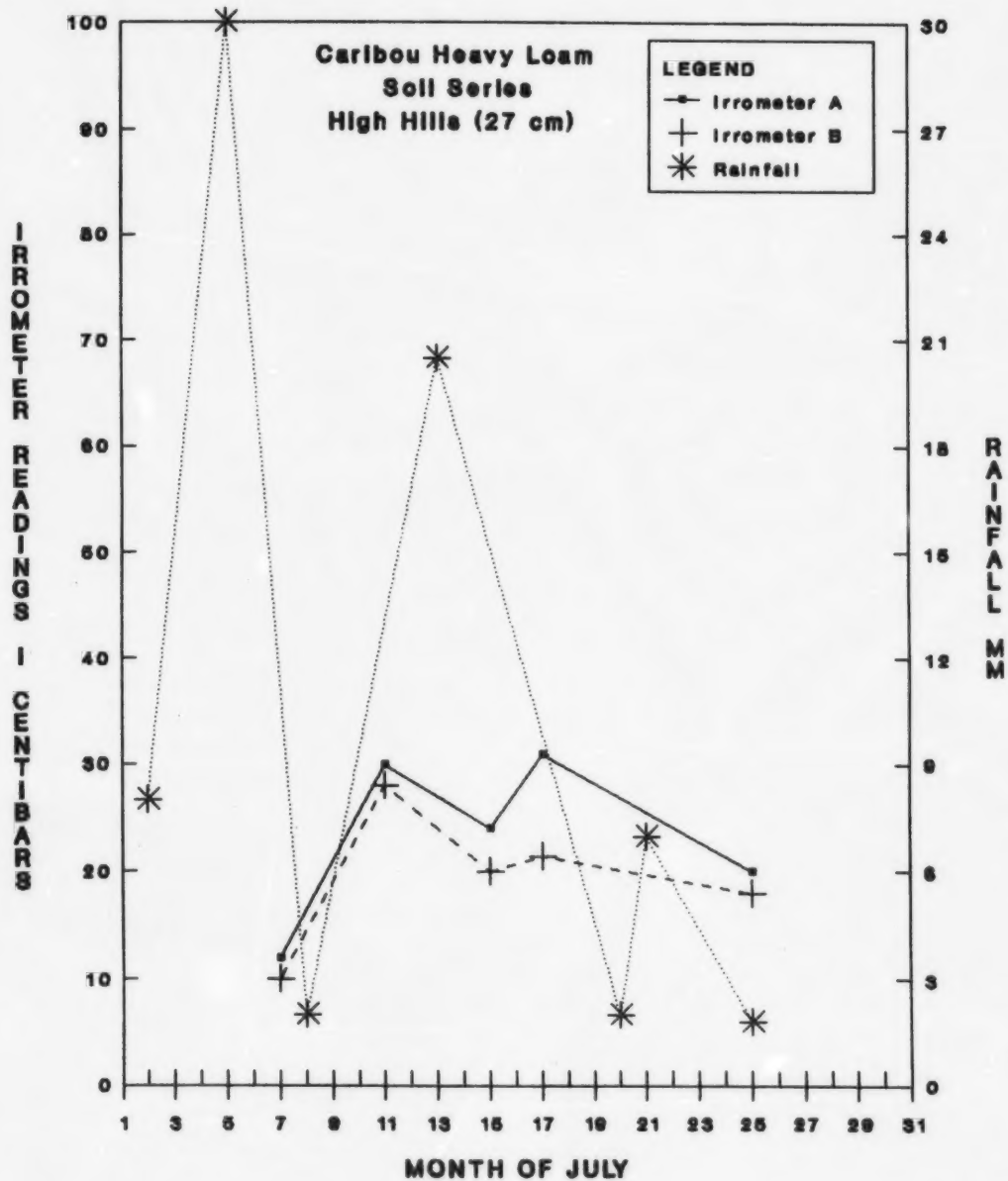


Figure 3A

Relationship between readings over time
with rainfall of 2 Irrometers
Installed at 4 cm (A) and 16 cm (B) depth below
the soil surface respectively.

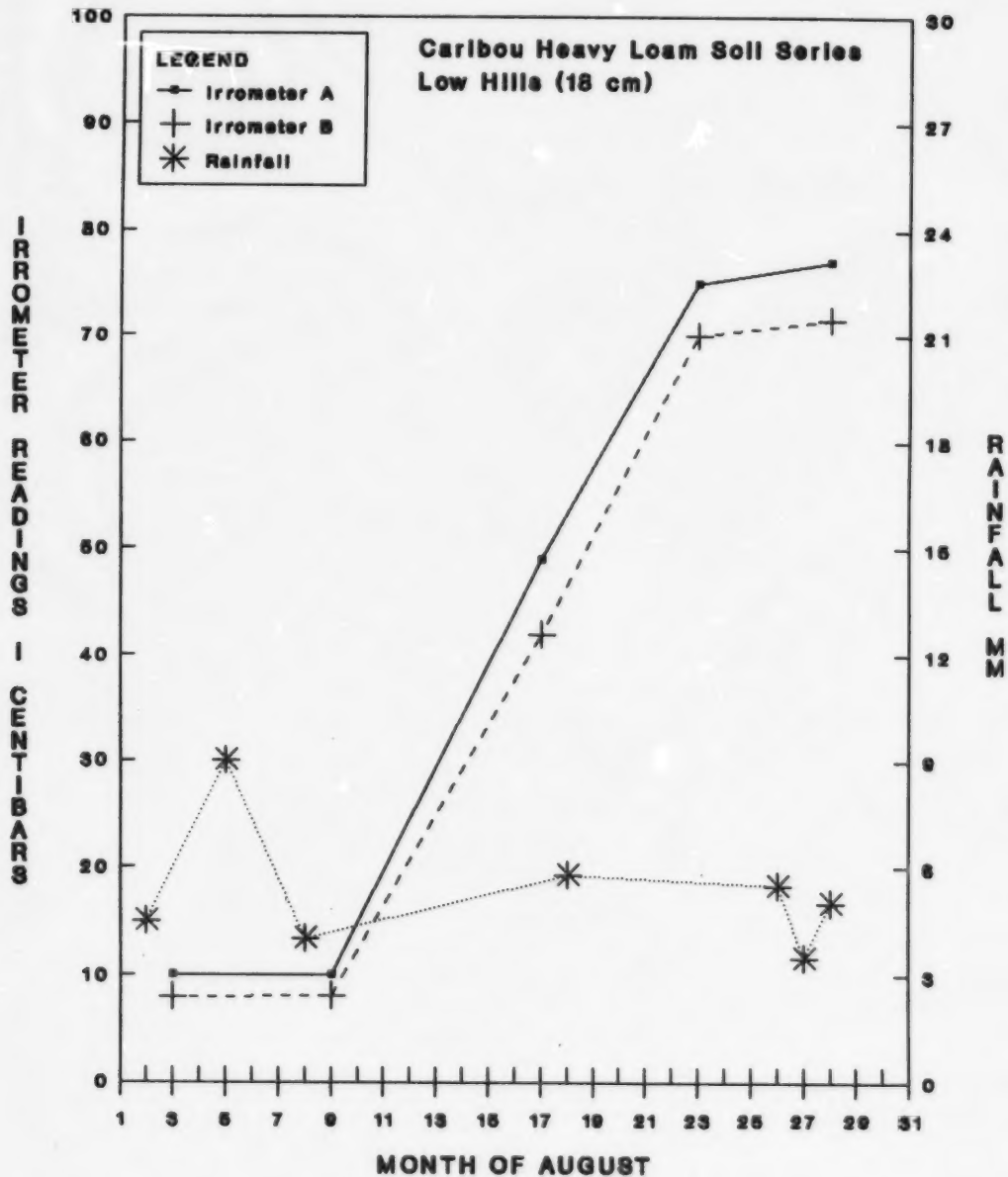
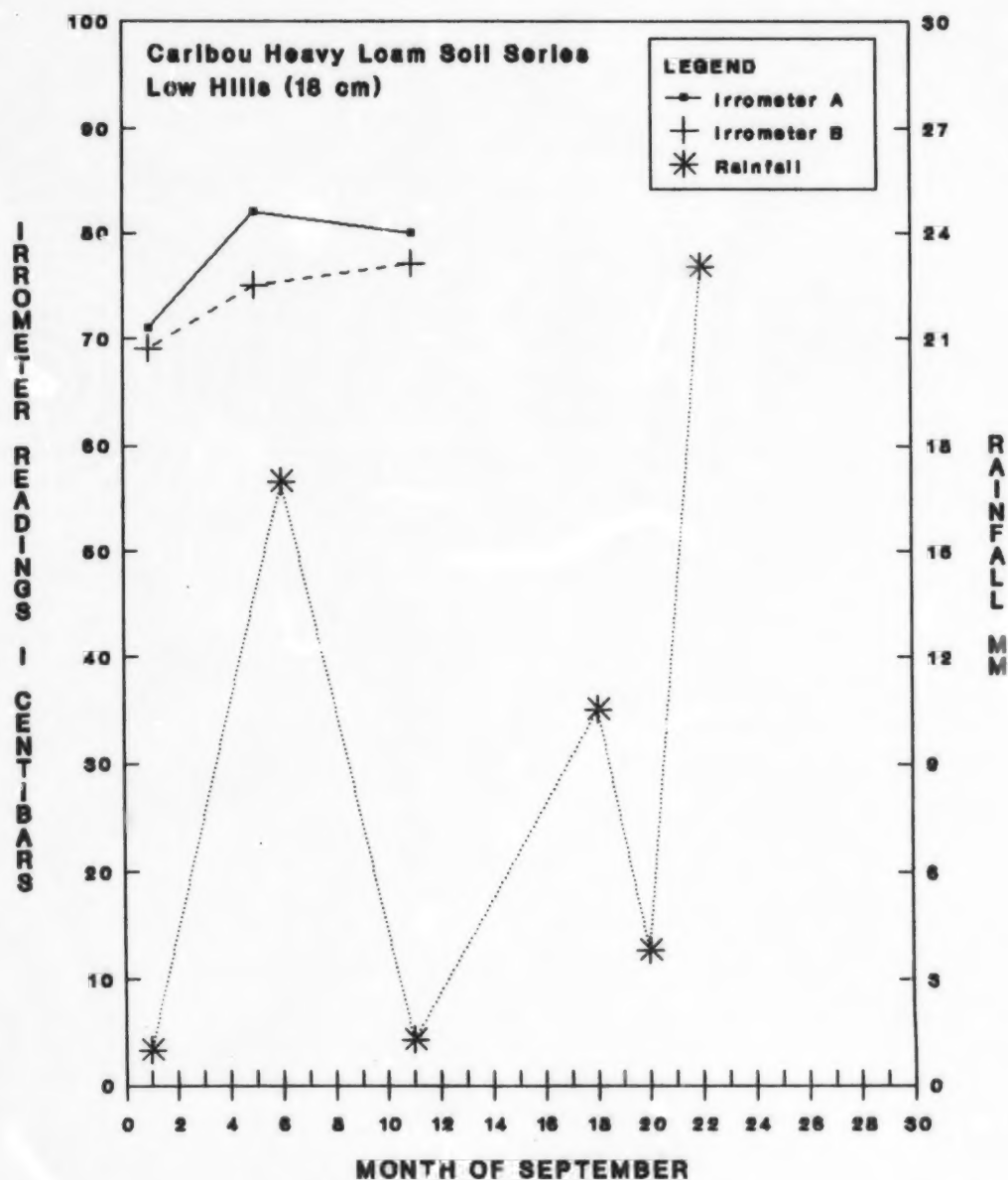


Figure 3B

Relationship between readings over time
with rainfall of 2 Irrometers
installed at 4 cm (A) and 16 cm (B) depth below
the soil surface respectively.



CONCLUSIONS: Irrometers provide more reliable means of determining irrigation requirements of the potato crop on the Caribou heavy loam soil than visual assessments. Two irrometers should be installed at each station in the hill after the crop has emerged to a height of 7.5 - 10 cm. On shallow, eroded soils where hills must be made high (27 cm or higher), one irrometer could be placed 3 - 5 cm below the ploughed soil surface (Irrometer A) and the other in the same hill 15 - 17 cm below the ploughed soil surface (Irrometer B). Irrometer A could be used to suggest when to start irrigation (50 - 60 centibars) to create a moist environment for the reduction of scab incidence on tubers. Irrigation should be stopped at 25 centibars reading or less on Irrometer A. Irrometer B could be used to suggest when to start irrigating (70 centibars and above) to prevent the crop from being under stress in terms of root and top growth. Irrigation should stop at 10 centibars when field capacity is reached.

With low hills (18 cm or less in height), one or two irrometers could be used as indicated above. If only one irrometer is used, it should be installed at a depth of 4 - 10 cm below the ploughed soil surface after the crop has emerged. Irrigation should commence when the irrometer reading is 70 centibars or above and stopped when the reading is 10 centibars or less.

Further research work on scab incidence in relation to height of hills and moisture regimes of hills should be undertaken.

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CALCIUM - POTASSIUM EFFECTS ON YIELD OF ALFALFA OVER TWO YEARS

R.P. Hinds and P.K. Scott

ABSTRACT: Alfalfa production was examined over a two year period on the Caribou Soil Series with a pH of 6.1 under three levels of calcium applications (Calcitic limestone 4.5t/ha; gypsum 4.5 t/ha; and control 0 t/ha) and with three levels of potash at 0 kg/ha; 336 kg/ha and 672 kg/ha. The alfalfa stand was established one year prior to calcium applications at location one. A split plot design was employed. Observation plots at another location examined five treatments control 0 t/ha limestone; calcitic limestone 4.5 t/ha; calcitic limestone 2.25 t/ha; gypsum 4.5 t/ha and gypsum 2.25 t/ha.

No significant differences in dry matter or protein were observed between the treatments at either location. Gypsum proved just as good as limestone though limestone increased the soil pH whereas gypsum did not. Neither the potash nor the potash/calcium interactions were significantly different from each other, but the optimum level of potash seem to be around 350 kg/ha. This has been confirmed by other research work in N.B.

Gypsum nonetheless presents itself as another alternative management tool to producers in the production of the crop.

EFFETS DU CALCIUM ET DU POTASSIUM SUR LE RENDEMENT DE LA LUZERNE PENDANT DEUX ANS

Résumé: La culture de luzerne a fait l'objet d'étude pendant deux ans sur les sols de type Caribou ayant un pH de 6.1. Les applications de calcium ont été faites aux taux de 4,5 t/ha de chaux calcique, 4,5 t/ha de gypse et 0 t/ha de calcium, et celles de potasse correspondaient à 0 kg/ha, 336 kg/ha et 672 kg/ha. La luzerne a été semée dans un dispositif expérimental en blocs un an avant les applications de calcium au premier endroit. Les parcelles d'observation situées à un autre endroit ont permis de vérifier l'effet de cinq traitements correspondant à des applications de 0 t/ha de chaux, 4,5 t/ha de chaux calcique, 2,25 t/ha de chaux calcique, 4,5 t/ha de gypse et 2,25 t/ha de gypse.

On n'a pas relevé d'écarts importants dans les taux de matière sèche ou de protéine enregistrés aux deux endroits. Le gypse s'est avéré aussi efficace que la chaux, quoique la chaux augmentait le pH du sol et que le gypse restait neutre. Les interactions avec la potasse n'étaient pas beaucoup différentes que celles obtenues avec le mélange potasse-calcium, et la quantité de potasse pour obtenir des résultats optimaux semble se situer aux alentours de 350 kg/ha. Cette conclusion a été confirmée par d'autres travaux de recherche exécutés au Nouveau-Brunswick.

Le gypse constitue donc un produit de remplacement intéressant pour les producteurs de luzerne.

INTRODUCTION: Alfalfa can be made into a highly profitable crop by making a few management changes to the old approach to alfalfa production. These changes can and have resulted in increases in alfalfa acreages across the province. Alfalfa responds dramatically to high levels of fertility and a complete production program.

Critical areas of alfalfa management include soil acidity, sulphur levels and potash fertility.

Alfalfa is very sensitive to soil acidity because microbial fixation of atmospheric nitrogen is inhibited in very acid soils. Under most conditions the best pH for alfalfa production is between 6.5 - 7.5 and yields are reduced when the pH is 6.0 or lower. Soils in N.B.

have naturally low pH's ranging from 4.8 - 5.2. The application of lime would mean about 8 - 16 t/ha to raise the pH to about 7.0 for alfalfa production. Not only is the pH requirement for alfalfa high but also in the production of hay (yields of 8-12 t/ha) the alfalfa crop removes from the soil the following nutrients: N-302 kg/ha; P-68 kg/ha; K-302 kg/ha; Ca 188 kg/ha; Mg - 36 kg/ha; S 32 kg/ha; Cl 46 kg/ha; B 0.1 kg/ha; Cu 0.1 kg/ha; Fe 1.3 kg/ha; Mn 0.7 kg/ha; Zn 0.7 kg/ha.

The calcium and sulphur requirements of the crop are indeed very high. Lime reacts very slowly with soil and during rapid growth readily available sources of calcium and sulphur are necessary. Given a pH of 6.0 - 6.2, all the calcium and sulphur needed by the crop can be readily supplied by gypsum, which is 100 times more soluble than limestone and does not change pH. One tonne of gypsum can supply 180 kg of calcium and 144 kg of sulphur. It must be noted that acid rain produces 9-12 kg/ha of sulphur and so falls short of supplying the 32 kg/ha needed by the crop.

Work done in the U.S.A. (IMC Fert. Inc.), and elsewhere has demonstrated in crops like peanuts, hay and barley where rapid uptake of calcium is needed by the crop, gypsum is a faster supplier than lime. Alfalfa requires high amounts of potash, especially in the fall when root reserves must be built up to "winterize" the crop and provide stored energy for rapid growth. A typical established stand of alfalfa (MacLean 1987) stand in N.B. requires about 300-400 kg/ha of nutrient of potash to replace what was removed by the current year's crop.

Timing of potash application is also important for persistence of the crop. It takes about six weeks to build up adequate root reserves for winter so that adequate potash must be available 6-8 weeks before a killing frost. These basic issues in alfalfa production have led us to believe that gypsum, as a source of calcium and sulphur, would be better than limestone when adequate supplies of potash are applied on stands of alfalfa grown in soils of pH 6.0 and above. A three year study was therefore undertaken to examine these effects on the Caribou Soil series.

METHODS:

Location I: A split plot design was employed on a one year old stand of alfalfa grown on the Caribou Soil Series in Woodstock. Replication was three.

Main Plots: 4.5 t/ha - calcitic limestone
 4.5 t/ha - gypsum
 0 t/ha - control
 -Calcitic limestone - 38% calcium
 -Gypsum - 20% calcium, 18% sulphur
 -pH of main plots - 6.1 - 6.6

***Sub-Plots:** - 672 kg/ha - potash
 - 336 kg/ha - potash
 - 0 kg/ha - potash

*Sub-plot size was 0.13 hectare. Potash was applied 1 week after 2nd cut in 1987 and 1988. Maintenance fertilizer rate was 336 kg/ha (spring application) of 5-20-20 blend in both years.

The following measurements were taken:

- soil tests prior to treatment with main plots and after sub-plot treatment.
- 1st cut - June 7, 1987; June 20, 1988
- 2nd cut - Aug. 10, 1987; Aug. 19, 1988
- Standard feed analysis done on 1st and 2nd cut - Dry matter %, Protein %, ADF %, T.D.N. %, Calcium %, P_2O_5 %, Mg %, K %.

Location II: The following treatments were disposed on one acre plots of a plant stand of alfalfa grown on the Caribou Soil Series in Woodstock for observation purposes.

1. Control - 0 tonne/ha
2. 4.5 tonnes/ha of calcitic limestone
3. 2.25 tonnes/ha of calcitic limestone
4. 2.25 tonnes/ha of gypsum
5. 4.5 tonnes/ha of gypsum
6. Control - 0 tonne/ha

Yield data was taken from these plots only in 1988.

RESULTS AND DISCUSSION: Effect of Calcium applications: Location 1: Table 1 shows the response of alfalfa to prior calcium applications. Alfalfa has a high requirement for calcium and sulphur with an 8.0 t/ha crop removing about 188 kg/ha of calcium and about 32 kg/ha of sulphur. In both years, there was no significant differences between the three treatments. The

interesting points though are the big decrease in % Ca from 1987 to 1988, the decrease in dry matter yield and the decrease in protein yield. pH increased by more than 0.5 unit where calcitic limestone was used and remained relatively constant where gypsum and no limestone was applied.

TABLE 1: RESPONSE OF ALFALFA OVER TWO YEARS TO PRIOR CALCIUM FERTILISATION - LOCATION I. MEAN VALUES.

*Treatments	Soil pH		% Ca in 2nd Cut		T/Ha - 2 cuts Total Yield			
	x1987	1988	1987	1988	1987	1988	1987	1988
Calcitic Limestone								
-4.5 t/ha	6.4	7.1	2.26	1.35	8.0	5.07	1.41	0.84
Gypsum -								
4.5 t/ha	6.2	6.5	2.06	1.35	8.5	5.27	1.44	0.82
Control -								
0 t/ha	6.3	6.4	2.20	1.23	7.8	5.24	1.32	0.84

*Calcitic limestone - 35% Ca x 1987 value taken
 Gypsum - 20% Ca; 16% Sulphur prior to treatment
 Effect of Potash/Calcium Applications:

Location I: Table 2 and Figures 1 and 2 show the effect of three potash treatments at three levels of prior calcium fertilization on yield of alfalfa at the time of second cutting.

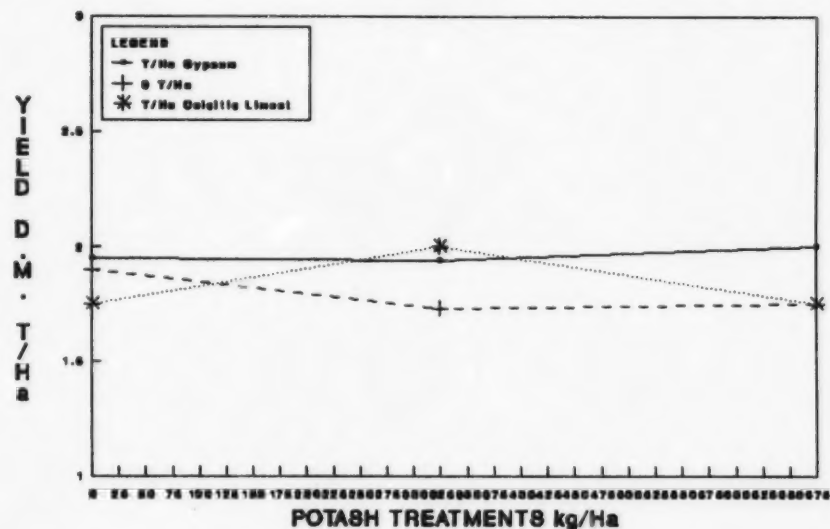
Potash is especially important in the fall when root reserves must be built up to "winterize" the crop and provide stored energy for rapid growth. Established stands in N.B. require 350-400 kg/ha of potash annually and so it was decided to examine the calcium/potash effects on yield. As timing is important, potash was applied after the 2nd cut to allow the crop to build up adequate reserves for winter.

There was no significant differences between the main treatments and their interactions in either year. However, in 1987, the highest level of potash (672 kg/ha) without limestone resulted in a dry matter yield decrease (Figure 1). In 1988, there was a steady decline in dry matter with the control treatment (Figure 2). Indications are that about 350 kg/ha of potash would optimise production.

Figure 1.

Yield of Alfalfa at 3 levels of potash
to prior calcium treatments-2nd cut 1987

LOCATION 1

**Figure 2.**

Yield of Alfalfa at three levels of
potash to prior calcium treatments

LOCATION 1

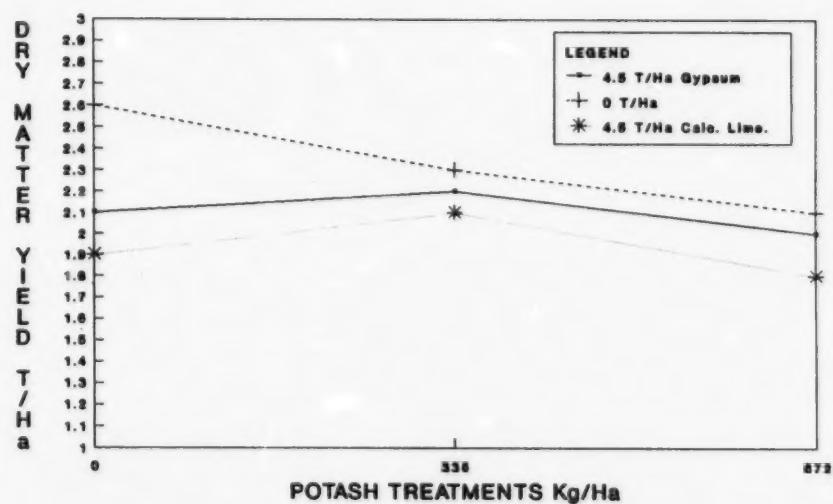


TABLE 2 - SUMMARY OF RESULTS

The Effect of Three Potash Treatments at Three Levels of Prior Calcium Fertilization on Yield of Alfalfa After Two Years - Location I.

Treatments	*Mean Yield - 2nd Cut Tonnes/Hectare			
	Dry Matter		Protein	
	1987	1988	1987	1988
1. Main Plots				
- 0 t/ha - Control	1.83	2.35	0.31	0.36
- 4.5 t/ha Gypsum	1.98	2.20	0.34	0.32
- 4.5 t/ha Calcitic Limestone	1.83	2.1	0.32	0.34
2. Sub-Plots				
- 0 kg/ha Potash	1.87	2.2	0.32	0.36
- 336 kg/ha Potash	1.89	2.2	0.33	0.34
- 672 kg/ha Potash	1.87	2.1	0.32	0.32
3. Calcium X Potash Effect				
- 0 t/ha x 0 kg/ha Potash - control	1.72	2.61	0.29	0.41
- 0 t/ha x 336 kg/ha Potash	2.00	2.24	0.34	0.44
- 0 t/ha x 672 kg/ha Potash	1.76	2.20	0.29	0.47
- 4.5 t/ha Gypsum x 0 kg/ha Potash	1.96	2.08	0.34	0.48
- 4.5 t/ha Gypsum x 336 kg/ha Potash	1.91	2.44	0.34	0.49
- 4.5 t/ha Gypsum x 672 kg/ha Potash	2.06	2.10	0.35	0.49
- 4.5 t/ha Calcitic limestone x 0 kg/ha Potash	1.92	2.19	0.34	0.48
- 4.5 t/ha Calcitic limestone x 336 kg/ha Potash	1.77	2.08	0.32	0.51
- 4.5 t/ha Calcitic limestone x 672 kg/ha Potash	1.79	2.08	0.31	0.50

*Not significant at 5% level

TABLE 3: THE EFFECT OF CALCITIC LIMESTONE AND GYPSUM ON YIELD AT ALFALFA PROTEIN - 1988 - LOCATION II.

Protein Yield - T/Ha			
Treatment	1st Cut	2nd Cut	TOTAL
0 tonnes limestone/ac	0.53	0.40	0.93
2 tonnes Havelock/ac	0.49	0.49	0.98
1 tonne Gypsum/ac	0.48	0.34	0.82
1 tonne Havelock/ac	0.50	0.50	1.00
2 tonnes Gypsum/ac	0.46	0.48	0.94
0 tonne limestone/ac	0.68	0.37	1.05

TABLE 4: THE EFFECT OF CALCITIC LIMESTONE AND GYPSUM ON YIELD OF ALFALFA DRY MATTER - 1988 - LOCATION II.

Dry Matter Yield - T/Ha			
Treatment	1st Cut	2nd Cut	Total
0 tonne limestone/ac	3.34	2.03	5.37
2 tonnes Havelock/ac	2.98	2.56	5.54
1 tonne Gypsum/ac	3.19	1.95	5.14
1 tonne Havelock/ac	2.83	2.90	5.73
2 tonnes Gypsum/ac	2.90	2.61	5.51
0 tonnes limestone/ac	3.31	2.21	5.52

Effect of Calcium Applications:**Location II:**

The results of these observation plots with calcitic limestone and gypsum are given in Tables 3 and 4. No differences were observed in terms of both dry matter and protein.

CONCLUSION: With the soil pH above 6, alfalfa would seem to be able to produce equivalent yields with or without further gypsum or limestone additions. Applications of potash at 350 kg/ha would seem to be the optimum application in the production of good stands of alfalfa.

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DARKENING THE SOIL TO ENHANCE GRAIN CORN PRODUCTION

George S. Read

ABSTRACT: The soil surface with its reflective and absorptive characteristics can influence the temperature of the root zone for some crops. A trial at Cornhill, New Brunswick attempted to modify the soil albedo with the objective of providing better growing conditions for corn. Two applications of a mixture of powdered carbon and water were sprayed in a ten cm band over the row. The first application was at seeding and the second at four weeks after seeding. The second application was used as the mixture was partially washed away. The treatment had no significant increase in percent dry matter accumulation at the October harvest date, however there was a dry matter yield increase of 15 percent at the .05 significance level. If a source of darkening material such as coal dust was available and environmentally suitable the application may be economically feasible, particularly in areas where grain corn is marginal.

NOIRCISSEMENT DU SOL POUR UNE MEILLEURE PRODUCTION DE MAIS

Résumé: La surface du sol possède des propriétés réfléchissantes et absorbantes qui peuvent influencer la température de la zone racinaire de certains végétaux. Un essai réalisé à Cornhill (Nouveau-Brunswick) visait à modifier l'albédo du sol dans le but d'obtenir de meilleures conditions de culture du maïs. Un mélange de charbon en poudre et d'eau a été appliqué à deux reprises sur une bande de dix centimètres à la surface du sillon. La première application a été faite à l'ensemencement, et la deuxième quatre semaines plus tard. La deuxième application a été faite parce que la première avait été partiellement lessivée. Le traitement n'a pas augmenté sensiblement le taux d'accumulation de matière sèche à la récolte d'octobre, mais on a noté une augmentation de 15 % de matière sèche compte tenu d'une marge de tolérance de 0,05 %. L'application d'une matière noircissante comme la poudre de charbon peut être rentable lorsqu'elle est disponible et neutre pour l'environnement, surtout dans les régions où la culture du maïs est très secondaire.

INTRODUCTION: The growing season for grain corn production in New Brunswick is limited for most areas. It is therefore desirable to increase the heat available to the plants. In some high value horticultural crops this modification becomes an economical option as is the case with using plastic or establishing windbreaks. However for large scale field crops with lower returns per acre it is necessary to keep costs very low when trying to improve the growing environment.

It has long been known that dark coloured surfaces warm up quicker and to higher temperatures than lighter surfaces. At the Hoyt provincial nursery, soil temperatures under a treatment of spraying the surface with a mixture of carbon and water, showed on average one to two degrees(C) warmer conditions at 20 cm. than untreated soil (Read, 1987a). The costs of this treatment could be kept to less than 10 dollars/acre if powdered coal dust was available. A trial of this treatment on cucumbers at Hoyt showed excellent yield increases over control plots (Read, 1987b).

The objective of this trial was to advance germination, growth, and maturity, and to determine the effects on yield.

MATERIALS AND METHODS: A trial was established on the farm of George Von Waldo in Cornhill, N.B. in the spring of 1988. Eight replicates were randomly selected in an existing 100 acre field. The only differences between the treated and control plots were two application with a backpack sprayer of a mixture of charcoal and water on May 26 and June 22. The concentration of spray material was 10:1; water to charcoal by volume. The mixture was sprayed in a ten cm. band over the seed row. The corn variety used was pioneer 6864.

Observations were made on germination, plant height, and tasselling. Dry matter comparisons on yield and percent moisture were made.

RESULTS AND DISCUSSION: Observations made on July 20, indicated more plants germinated in the treated plots than the control. On average, the dark plots had 40.6 plants/plot while the untreated areas had 34.4 plants/plot.

The average heights of plants for each plot as of July 20, 1988 are indicated in table 1. The average of all plots for the dark treatment was 96 cm., and for the untreated plots was 82.9 cm.

Table 1. A comparison of plants heights for treated and untreated plots at Cornhill, N.B. on July 20, 1988.

Treatment	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Aver
control	76	101	112	87	70.5	92	69	57	82.9
dark*	96	105	155	103	85.5	98	65	59	96.0

All measurements in cm.

* Significant at 0.05% level.

The number of plants with tassels as of July 26, 1988 are shown in table 2. This result shows a slight advance in rate of development. Tassels were generally more developed in the darkened plots.

Table 2. A comparison of tassel number as of July 26, 1988, at Cornhill, N.B., between dark and untreated corn plots.

Treatment	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Aver
control	21	24	33	14	16	33	12	7	20
dark*	28	28	37	27	29	33	13	11	26

* Significant at 0.05% level

Silk counts were done on August 9, 1988 and are indicated in table 3. An earlier pattern of development in favor of the darkened treatment appears to be lessening, perhaps due to a more closed in canopy or due to the soil darkening being washed away.

Table 3. A comparison of silk count as of August 9, 1988 at Cornhill, N.B., between dark and untreated corn plots.

Treatment	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Aver
control	33	39	45	41	41	40	50	44	42
dark	42	41	40	47	49	45	40	38	43

Due to an untimely sampling from someone conducting a corn survey, plot reps numbered 1,2,5, and 7 were not available for harvesting on October 7, 1988. Statistical analyses were performed on the remaining four reps for yield and percent moisture content.

The corn was weighed, dried and reweighed to determine the percent moisture content. There was no significant differences between the treated and untreated corn plots which were within one percent of each other on average. A comparison of dry weight yield did indicate a difference of 15% greater yields on average from the treated plots which was significant at the 0.05% level of confidence.

CONCLUSIONS: Surprisingly the corn treated with the soil darkening charcoal had a 15% greater yield than the untreated corn plot, however there was no difference in percent moisture content. The yield comparison was done from a much larger sample (thirty ears) and the dry matter determination was from a sub-sample of three ears. Observations on germination and plant development indicated an advantage earlier in the season from the charcoal which may have disappeared by harvest in October.

The trial results were encouraging from a yield perspective and should be expanded to a larger test plot. Questions still remain about any advances in maturity as measured by percent moisture content. Some difficulties in keeping the mixture on the soil after heavy rains was encountered and needs to be resolved. A larger field plot could also address the application methods and economic of this practice.

ACKNOWLEDGEMENTS: The author would like to Mr. George Von Waldo for his excellent cooperation and the use of his land. The author would like to thank Ms. Nancy Smith and Ms. Rekha Nigum for their dedicated field work on the project.

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